1996


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DEVELOPMENT AND EVALUATION OF AN INSTRUMENT FOR ASSESSING
TRANSFER OF LEARNING TO THE WORKPLACE

A Dissertation
Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in
The School of Vocational Education

by
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May 1996
DEDICATION

To my wife Gertraud, whose personal sacrifice and loving support made this effort possible.
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ABSTRACT

The primary purpose of this study was to develop a simple, low-cost, easy to administer and score post-course participant survey that examined perceptions of the influence of certain factors identified as affecting the transfer of learning to the workplace. These factors were in the areas of course design, delivery and relevance as well as personal, organizational and workplace influences on learning transfer. The instrument also used participant perceptions to estimate the level of application of the course learnings before and after the course, their impact on work product and any significant individual or organizational changes resulting from them. Finally, the instrument tested for significant relationships between learning and selected workplace factors.

Three computer software courses were selected for developing and applying the instrument design. The instrument was applied to previous course participants. The results demonstrated that job classification, reporting organization, instructor, peer and supervisor support did not generally influence post-course software utilization. The responses pointed out some areas where course design could be strengthened. The instrument also pointed out that the software was not being fully utilized on the job even though course attendance significantly increased software utilization. Finally, the instrument indicated that levels of course-related ratings did not translate directly to rated levels for changes in productivity and quality resulting from attending the course.

The instrument developed for this study can be used as a template for developing simple, low-cost post-attendance evaluations for a wide variety of training programs. An instrument of this nature allows organizations to take the pulse of their training interventions and determine if further, costlier study or intervention is warranted. With such a template, organizations can move toward much greater accountability for insuring that training is providing the desired changes in the workplace and that the
workplace is ready to embrace those changes. Such an instrument could also be adapted to the educational environment to evaluate courses linked in program progressions as well as the integration of programs of study with the workplace.
CHAPTER 1: THE PROBLEM

Study Rationale

The face of the American workplace will undergo significant changes over the next decade (Coates, Jarratt, & Mahaffie, 1991). These changes will be driven by increasing world-wide competitive pressures and advances in technology (Cohen, 1991). While the demographics of the work force are currently shifting (Coates et al. 1991), the new workplace will require a better educated and more rounded employee (Feldman, 1991). The inability of the American educational system to keep pace with accelerating demands on both entering and existing employees creates a need to continue education into the workplace (Crawford & Webley, 1992). The demarcation between education and employment will quickly disappear as continuing and lifelong educational systems are adopted by organizations wishing to compete in the new economic order (Lynch & Kordis, 1991).

A shift in employment from manufacturing to service industries and from hands-on to knowledge-based jobs are signs that the American workplace is being driven by the globalization of the market economy (Crawford & Webley, 1992). Higher output ratios of quality goods and services relative to wages are being demanded (Blonston, 1993). This demand translates to the general reduction of the workforce on one hand and increased emphasis on the ability to learn on the other. Individual employees are asked to assume greater responsibilities for problem-solving, teamwork and decision-making (Coates et al. 1991; Cohen, 1991; Sheridan, 1991).

Shifts and changes in workforce demographics are having dramatic affects on the available American labor pool. The aging of the workforce creates new opportunities and challenges. So does the increased availability of a workforce composed of women, blacks, hispanics, asians, immigrants, foreign nationals and other traditionally minority groups. Increased use of contract, temporary and part-time workers also impacts it.
Add to these factors the decline in labor availability due to the reduced birthrates of the sixties and seventies and the failure of the US educational systems, including those in higher education, to keep up with non-professional, technical and professional entry-level skill requirements (Gayeski, 1991).

The American workplace cannot afford to wait until the educational system realigns itself to meet entry-level needs (Crawford & Webley, 1992; Feldman, 1991). The acceleration of competition and technology will bring a continuous need to adapt and change in the workplace. Training and educating a diverse workforce to the unique needs and technologies of a business are becoming critical to the survival of each business. Lifelong learning will be paramount at all levels of the organization (Lynch & Kordis, 1991).

Large disparities in the education of the incoming workforce as well as changing requirements in the workplace itself are driving the need for greater training assessment and accountability. Assessment will play a major role in screening the incoming workforce, placing the existing workforce and determining the need for additional individual job and career training (Cohen, 1991).

Where training is used as a workplace intervention, accountability for the results is necessary to justify the resources invested in the endeavor (Ludeman, 1991; Schneier, Guthrie, & Olian, 1988). Accountability through evaluation serves to indicate how well training objectives are met, whether the right objectives are addressed and how significant the objectives are to the needs of the workplace (Carnevale & Schulz, 1990a). Without accountability, training interventions cannot prove their effectiveness or efficiency (Brinkerhoff, 1987). In today's highly-competitive environment, those activities that cannot demonstrate accountability are short-lived. The ability of a training organization to account for its contribution is directly linked to the bottom-line
of the business it serves and impacts the long-term survival of that business (Carnevale 
& Schulz, 1990b).

Although the competitive and legislative pressures to increase training abound, 
there is little evidence that relates training investment to training results. If training 
evaluation is conducted, it is generally at the simplest level: participant reaction to a 
course (Gordon, 1991b). It rarely goes beyond evaluating learning at the end of a 
course to determine if learning translates to changes in job behavior (Hawthorne, 
1987). Nor does it appear that the benefits to the organization are measured and 
assessed against the original objectives and costs.

Evaluations of workplace programs lack scientific basis. There appears to be no 
basis in educational philosophy (Ingols, 1987). The outcomes of some types of 
training, primarily dealing with the soft skills, are difficult to measure (Gordon, 1991a). 
Organizations are reluctant to invest additional cost to training programs by conducting 
rigorous training evaluations (Gordon, 1991b).

As a result, significant time and money resources are being put into developing or 
obtaining training programs (Ludeman, 1991) with no effective mechanism to indicate 
the efficiency or effectiveness of these programs. In the worst case, training investment 
may be like a tax to a company. It is there because it is mandated but it provides no 
improvement in organizational productivity. It does not contribute to a competitive 
edge. Companies may be discouraged from investing in training because they have no 
way of isolating the benefits.

Under severe time and cost constraints, the challenge is to provide a meaningful 
measure of training effectiveness without channeling resources away from the training 
effort itself. The measure should exhibit enough discrimination that it provides 
feedback to modify and improve course design. At the same time, the feedback it
provides should give management an indication of how well it addresses organizational objectives.

Problem Statement

Camevale and Schulz (1990a) point out that most training practitioners use the Kirkpatrick model for training evaluation. They continue that less than half of the training programs in America are formally evaluated. Related to Kirkpatrick's four levels, more than 75% of the organizations in the American Society for Training and Development (ASTD) research referred to by Carnevale and Schulz (1990b) used reaction level evaluations. At the learning level, 25% of all training programs were evaluated. This same percentage is true for the results, or organization, level. Only 10% of the companies included in the ASTD research performed behavior level evaluation (Level 3). Of a group of 29 participants at an American Society for Training and Development workshop on evaluation, only 2 or 3 members said they did any Level 3 evaluation (Hale, 1994). Geber (1995) cites Training's 1994 Industry Report where 62% of the respondents claimed to do some Level 3 evaluation. Of those reporting to perform Level 3 evaluation, they did it on 45% of their courses. This is a marked increase from the 1990 research referenced by Carnival and Schultz, above. Geber goes on to conclude that this marked increase may be due more to an acknowledgment of organizational pressure than to actual fact. It does, however, reflect the current spotlight on evaluating organizational impacts related to training.

Brinkerhoff (1987) cites a 1986 poll by Meigs-Burkhart of major corporations. The poll found that less than half of the human resource development (HRD) programs were evaluated. Ingols (1987) says that evaluation of [management] education programs is minimal and less than scientific.

Ingols (1987) continues that there appears to be little cross-referencing to other evaluation studies for those that have been published. Educational evaluation research
does not seem to be based on educational philosophy. Major published empirical studies of management education programs deal with method instead of results.

Easterby-Smith and Mackness (1992) note that a 1985 survey in Personnel Management showed that few companies evaluated beyond participant reaction sheets and little action was initiated from them. Ban and Faerman (1990) relate that the process of training evaluation remains primitive, focusing on Kirkpatrick's first two levels: participant reaction and tests for learning. It does not necessarily follow that favorable participant reaction or good scores on tests translates to changes in job-related behavior.

Questionnaires and reaction forms dominate pre- and post-evaluation instruments in corporate education. The weaknesses in the survey method are questionable validity from relying on the participant's ability to properly evaluate the program as well as measurement that does not look at job performance as an output (Beer, 1990).

Gordon (1991b) says that most employee training programs in the US are evaluated at the reaction level. Few go beyond the learning level. Any behavioral change evaluation is anecdotal. Gordon notes that most organizations do not wish to add additional cost to training programs by conducting rigorous evaluations. Hawthorne (1987) cites several surveys that indicate evaluations of corporate management education focus on the reaction level. At IBM (Gordon, 1991a), training evaluation follows Kirkpatrick's four-level model. The training director, Ken Lay, notes that it is unrealistic to perform a rigorous evaluation through to the final level. This is particularly true for training in soft skills.

Carnevale and Schulz (1990b) point to research by the American Society for Training and Development that shows the practice of evaluation in the field does not strictly follow the recommendations in literature. Although field practices do not meet
the rigors of academia, they are cost effective, easy to conduct and reproduce and do provide valuable information.

In a review of numerous management education evaluations published primarily in Training and Development Journal from 1965 to 1979, Hawthorne (1987) cannot find any evaluation outcomes linked to program modifications. Little evidence was exhibited that evaluation was integral to the education effort. Hawthorne notes that there is little evaluation of training transfer from the classroom to job performance. Brinkerhoff (1987) concurs that business and industry program evaluation is results-oriented. Little emphasis is placed on the evaluation of the program design itself, only on assessing the outcomes.

Training evaluations are generally aggregated; individual differences are lost. As such, the business does not know what individuals benefit the most, and the least, from the training. There may be a tendency to perform shotgun, rather than targeted training. This can lead to poor use of the corporate training resource and non-productive time spent in training (Hawthorne, 1987).

Compounding the problem, standardized assessments are hard to find because of the characteristic uniqueness of companies and industries (Schwaller & Slipy, 1985). The bulk of existing literature is oriented toward educational institutions. Most is not relevant to the industrial, job-related environment (Kulp, Childs, & Schumacher, 1978). Where literature is available, few detailed procedures exist (Schneier et al., 1988).

Generally, Ban and Faerman (1990) found that literature recommending experimental approaches to training evaluation were too optimistic for the real world. Objective measures evaluation is generally difficult in an organization. Organizations do not normally have a natural system of measurement in place that corresponds to the training objectives. Resources to conduct such measurement are usually beyond the training department.
The small percentage of programs that are evaluated for learning transfer to the job is probably due to the costs associated with meeting rigorous design criteria, the lack of resources in the typical training department and the sparsity of a standardized assessment methodology (Grider, Capps, & Toombs, 1990). The low percentages of Level 3 evaluations reported in the literature indicate that anywhere from 70 to 90% of training programs are never reviewed for learning transfer. A more effective program might be a less rigorous and costly but discriminatory survey that could generally be applied to most training programs. Based upon this initial feedback, an organization could test to see whether it had enough data to initiate action, invest in further evaluation or drop any further inquiry.

Study Objectives

The primary purpose of this study was to develop a simple, low-cost, easy to administer and simple to score post-course survey instrument that examined participant perceptions and differences in the following areas:

1. Examined course participant perceptions of the influence of certain factors identified in relevant literature as affecting the transfer of learning to the workplace. The general categories that these factors belonged to were (a) course delivery, (b) course participant involvement, (c) course construction, (d) job relevance, (e) participant confidence, (f) organizational support, and (g) environmental barriers.

2. Used participant perceptions to estimate the level of application of the course learnings before and after the course, their impact on work product and any significant individual or organizational changes resulting from them.

3. Determined if significant differences in learning exist across certain respondent demographics and whether there was a relationship between learning and selected workplace factors.
4. Determined if there were any significant instructor differences within a course.

The specific objectives of the study were to:

1. Describe the respondent demographics for course attended, instructor, job classification and local reporting organization.

2. Determine how well the major enabling and terminal course objectives were understood by the respondents. Terminal objectives define the participant SKA's that they should exhibit when they return to the workplace. Enabling objectives are those that support the terminal objectives.

3. Determine how important these course objectives were to job performance.

4. Determine the respondents' confidence in their ability to apply these objectives to their jobs.

5. Determine the extent that course examples relating to the respondents' job were used.

6. Determine the extent that respondent involvement through discussion and practice was incorporated in the course design.

7. Determine how satisfied the respondents were with course instructional methods.

8. Describe the level of supervisor and peer support for applying the course content to the job.

9. Identify the presence and extent of physical respondent and workplace barriers hindering the transfer of course content to the job. Barriers include such things as lack of equipment, tools, workspace, budget or support staff.

10. Estimate the impact of course content on the respondents' work product in terms of productivity and quality.
11. Estimate the percentage of time the respondent had the opportunity to apply the course content.

12. Estimate the percentage of opportunity time the respondent applied the course content before and after attending the course. Calculate the difference in pre-post application time as Application Gain and determine if it is significant.

13. Determine the respondents' satisfaction with how well the overall course met their related job needs.

14. Determine if there were any content areas that should have been included in the course but were not.

15. Identify suggested improvements to the course.

16. Identify significant respondent or organizational changes resulting from applying the course content.

17. Determine if there were any statistically significant differences in application gain between Job Classification and Local Reporting Organization.

18. Determine if there was a relationship between application gain and organizational support, work product or job relevance.

19. Determine if there was a statistically significant difference between instructors for the understanding and confidence components of the course objectives, the use of work-related examples, practice and discussion and the overall respondent satisfaction with the instructional methods.

**Study Significance**

With an instrument that is straightforward, cost-effective and generally applicable to a wide variety of training programs, organizations can evaluate whether and how much they have an impact on performance in the workplace. Where training programs do not meet workplace needs, those programs can be tuned or scrapped, as the case may be. Where the programs are not fully supported in the workplace, the instrument
design can help point out where the problem lies and prevent working a training solution when training is not the problem. With such an instrument, organizations can move toward much greater accountability for insuring that training interventions are providing the desired changes in the workplace and that the workplace is ready to embrace those changes. Applying a Level 3 evaluation instrument to all or a majority of training programs helps to emphasize management's commitment to accountability for learning transfer in all training programs, not just a select few.
CHAPTER 2: RELATED RESEARCH AND THEORY

Background and Setting

Ludeman (1991) cites Jac Fitz-Enz of the Saratoga Institute that US companies spend an average of $500 per employee for formal training each year. The citation continues that companies with more than 100 employees spent $45 billion on classroom training in 1990. Harvard Business Review confirms that US employers spend nearly $40 billion dollars annually on formal training programs (Stone, 1991). This level of expenditure approached the total undergraduate and graduate expenditure in the US in 1985 (Endres & Kleiner, 1990). Stone goes on to say that the bulk of this money is spent by only 1/2% of these employers. The others spend less than 2% of their payroll on employee training.

Pressures On Business.

Radical changes in both economics and demographics will occur in the American work force over the next 15 years (Coates et al., 1991) Pressure to change is coming from a combination of rapidly changing technology and foreign competition (Cohen, 1991). Speed, competency, complexity, efficiency and globalization are shaping future business. Product life cycles are becoming shorter, along with the time it takes to develop, market and copy a product. (Lynch & Kordis, 1991). High technology and production systems will integrate floor management with work, product and process designs. National and international pressures are mounting for high quality, low cost, production flexibility and on-time delivery systems (Fletcher & Alic, 1991). The most successful organizations in today's world markets emphasize efficient and flexible production over invention (Blonston, 1993: O'Reilly, 1992).

These mounting pressures will require organizations to improve employee professional, managerial and entrepreneurial education and skills (Crawford & Webley, 1992). Information technologies, greater job complexity due to work redesign and
computer-based production and work processes are driving workplace skill
requirements toward knowledge-based work and greater responsibilities over broader
job classifications (Coates et al., 1991). In addition, more people will be working from
home, the road or satellite work stations. Increased use of intelligent hardware and
software will boost performance. New applications for job aids, expert systems,
interactive multimedia training and performance support systems will need to be
developed to support the organization and enhance productivity (Gayeski, 1991).

Expert systems and Artificial intelligence (AI) promise to be the biggest technical
breakthrough by the end of this decade. Estimates are that AI will impact 60-90% of
jobs in large corporations by the year 2000. It will mimic human communication and
thought patterns. It has the capacity to provide stand-alone machines that are free of a
central controller or wired networks (Coates et al., 1991).

The increasing globalization of the economy encourages mergers and acquisitions
supporting the development of truly multinational firms. This will influence
organizational structures and bring a new dimension to workplace diversity and worker
integration into multiple levels of marketing, sales and customer relations. Global
competition, changing social values, new demands for quality and service and new
markets in electronic technology will influence marketing and sales. Increasing demand
on time is an overriding influence (Coates et al., 1991).

The growth in multinational partnerships and the emergence of Eastern Europe
into the competitive world market place exerts great economic pressures on the
business place. Transnational organizations are beginning to develop. These are truly
world organizations that transcend national boundaries. Future management will have
an orientation based on different cultural experiences and beliefs. This will affect how
organizations hire, manage, train and promote. Organizational focus will shift to job
performance rather than appearance, personal values or apparent attitudes (Gayeski, 1991).

**Pressures On The Work Force.**

The Information Revolution that we are currently experiencing has had such a major impact on the availability of information and the control of manufacturing processes that it rapidly outdates previous education and training. The service industry now contains three-quarters of the US work force and the shift from manufacturing to service is still continuing. For the 20% of the work force that remains in manufacturing, automation is replacing the need for hands-on jobs with knowledge-based ones. Routine production jobs that are not automated are moving abroad to lower cost areas. Workers who primarily manipulate data and information currently represent 20% of US jobs and 40% of the GNP. Real income and fees are increasing at 12% per year for these workers. On the other hand, inflation-adjusted income from routine production jobs is at 1966 levels (Crawford & Webley, 1992).

According to O'Reilly (1992), middle-class jobs are being replaced by lower-wage jobs, making it more difficult for only one family member to be the sole support. He says that the Census Bureau reports that less than 20% of the full-time work force had low wage jobs in 1979. Of the 13.6 million full-time jobs added during the eighties, better than a third were below the poverty level for a family of four. Nearly a third of these jobs was in restaurants, stockrooms and retail sales with low advancement potential. Adjusting for inflation, the median annual wage for all workers dropped almost five percent between 1979 and 1992. Because of rising costs, benefits associated with jobs are being reduced.

Blonston's article (1993) shows a real wage decline for all education levels below advanced degrees from 1988 through 1992. He notes the continuing pressure on business to produce higher quality at a lower price. This has resulted in suppressed
wages and layoffs. Even in job areas that have seen the most job growth -- management, service, operators, laborers and assemblers -- wage increases are below or just above the inflation level. The projected change in the service area between 1990 and 2005 is a 27% increase in employment with a corresponding 41% increase in output. For manufacturing, on the other hand, the same projected increase in output will be contrasted with a 3% reduction in employment.

Work Force Requirements.

Contrary to reducing the skill levels, it is through attracting and developing a highly skilled workforce that companies will be able to provide the requisite flexibility and responsiveness in product delivery and services (O'Reilly, 1992). High-performance organizations give front-line workers responsibility for decision-making, problem-solving and process improvement (Sheridan, 1991). Corporations promote empowerment by giving workers the power and responsibility of self-management to generate greater productivity. Advances in information technology and a better-educated work force make this possible (Coates et al., 1991). Emphasis will shift to those workers who are adept at acquiring new knowledge and skills. The ability to learn will determine which job applicants get hired. More sophisticated workplace technology will require greater skills in the areas of judgment, diagnosis and inference (Cohen, 1991).

Empowerment means developing a work force with broader and stronger skills. Multiskilled employees are replacing specialists whose contribution to the organization is limited. Responsibility for such functions as inspection, quality control, routine maintenance, interdepartmental and customer relations and problem-solving is being shifted to non-supervisory employees as both the supervisory and non-supervisory work force is being reduced. Specialized crafts are being merged into more generalized functions (Fletcher & Alic, 1991).
Work Force Demographics.

In addition to the impacts of globalization and increased demands for more education, work force demographics will be influenced by population aging, minorities, a shrinking labor pool, and women. Although expectations are that the general population will grow by 7% during the nineties, people between 35 and 44 years of age will grow by 16% and those between 45 and 54 will grow by 46%. Healthier lifestyles will extend the age of individuals in the population. This will create a shift in the average population age that will influence market and political policy, as well as business policies concerning health-care, retirement plans and retiree employment (Coates et al., 1991).

Hispanic populations are growing at a rate five times greater than the rest of the population. These populations share values similar to other North Americans, including that of upward mobility. Their language and culture will become a greater and greater influence in the American mainstream (Coates et al., 1991).

By the end of this decade, blacks will compose 12% of the labor force. Close to 70% of the black population is making the transition into the American mainstream, from rural to city, unskilled and blue-collar to white-collar. They are making gains both in political and economic power, moving up in government and corporations. On the downside, the remainder of the black population is not making the transition and remains embedded in a goalless subculture of poverty (Coates et al., 1991).

A shortage of qualified job applicants is due to the lower birth rate of the sixties and seventies and the failure of US schools to provide students with entry-level job skills in literacy and math (Gayeski, 1991). An overall decline in the labor pool will create opportunities for the traditionally unemployed. These are individuals who have limited skills or abilities and those who cannot, or will not, work full-time. As labor becomes more scarce, women, older workers, immigrants, temporary and part time
workers, the handicapped, the emotionally impaired, the illiterate and ex-convicts become options to supplement the work force (Coates et al., 1991; Gayeski). Gayeski (1991, p. 45) states that "only 15% of new entrants to the labor force will be native white males." She says further that, in addition to addressing this incoming work force, the productivity of the existing work force needs to be improved.

Women are moving into the ranks of management and, by force of numbers, will become influential in the executive levels. Women who can compete for careers in the workplace are limiting their childbearing; some are curtailing it altogether. Asian Americans are completing high school in greater percentages then the rest of the population. They will have increasingly better opportunities in the workplace (Coates et al., 1991).

**Entry-Level Work Force Education Requirements.**

The backbone of high-performing organizations is math and reading skills (Sheridan, 1991). Fletcher and Alic (1991) report that prospective employees are being screened for good basic skills, training beyond high school and a willingness to be trained and accept greater responsibility. The company will consider these core employees as an investment. They note that Diamond-Star Motors, a joint venture between Chrysler and Mitsubishi, hired 3,000 workers from 50,000 applications. These workers averaged 14 years of education.

An American Management Association (AMA) survey found 93% of the responding firms were continuing to test applicants until they met their employment goals for qualified candidates. As America's workplace literacy demands increase due to world market competition, her population is decreasing. Companies will find it more and more difficult to avoid training through tighter employment screening. The situation will become aggravated as the percentage of minority group representatives and immigrants in the worker pool increases during the rest of the decade. These
individuals traditionally have poorer educational backgrounds or are deficient in English reading and speaking skills. The competitive workplace needs workers with more than the basic skills. They need to understand new technologies and use critical thinking and problem solving to perform more decision-making (Feldman, 1991).

**Entry-Level Work Force Education.**

Both the current educational system and our national attitude toward education have not caught up with the change from mass production and oversimplification to flexibility, adaptability and empowerment (O'Reilly, 1992). National Assessment of Education Progress (NAEP) studies of primary through secondary students since 1969 show that the performance level of students has not declined. However, the demands of the competitive environment have increased. More than two-thirds of today's jobs require reading literacy beyond the ninth grade. Although 20% of employees reading at or below the eighth grade was acceptable 20 years ago, they are illiterate by today's standards (Feldman, 1991).

Employees without post-secondary education are seeing their routine jobs replaced by automation while mid-level employees are using automated systems to help them increase their job scope. Advanced specialty degrees, such as MBA's, are falling out of favor as organizations place more emphasis on interdisciplinary skills and knowledge. Hierarchical distinctions are blurring as decision-making and problem-solving are moved down to more highly skilled front-line employees (Sorohan, 1993).

Sheridan (1991) cites a 1990 study by the Commission on the Skills of the American Work force that concluded that, unlike the Japanese, American post-secondary education does not address the needs of the front-line workforce. He continues that 42% of the members surveyed at the 1991 annual meeting of the Association for Manufacturing Excellence (AME), placed workforce education and skills as their first concern.
According to Crawford and Webley in 1992, national needs for professional scientists, engineers and managers are not being met by higher education. Rather, US graduates are being attracted to law, financial services and consulting. Individuals educated in the vital technical and managerial areas are increasingly foreign nationals who may not want to permanently relocate to the US. As the population of eighteen-year-olds in the US declines, the competition for qualified individuals between employers and institutions of higher education will intensify. They conclude that this competitive pressure may result in decreased requirements for a traditional college education.

Crawford and Webley (1992) continue that relying on market forces to realign the educational system to the needs of business may take too long. They say that it would take a minimum of five years for higher education to produce output if it could begin today. This assumes that the instructional staff does not need retooling and will not move to fill the void in the business community. Invoking government involvement in US education is difficult due to the decentralization of the school systems into the states. Even if such initiatives could bear fruit, it would not be ripe for many years.

Characteristics Of The Work Force.

Many organizations are undergoing a restructuring that emphasizes greater decentralization and entrepreneurship at all levels of the firm (Cohen, 1991). The layers of middle management are disappearing as computerization, artificial intelligence, biotechnology, genetic engineering, micro-machining and self- and team-management become more embedded in the business organization. Organizations expect individuals to improve their productivity and skills while taking on increased responsibilities. Workers who do this are increasingly being viewed as a corporate asset (Coates et al., 1991). Management by behavior control is giving way to tending to workers' needs and systems for tracking results (Lynch & Kordis, 1991).
Organizations that have high ratios of middle managers, average productivity, quality and service, along with those organizations not operating on the leading edge of their industry, are in danger of being displaced. Workers are obsolete who are not ready to learn and not considered elite, focused, dependable, elegant or responsive. Middle-aged workers are in danger, especially if they have stopped growing in markets where youth, education, productivity and technical skills are at a premium (Lynch & Kordis, 1991). Downsizing due to automation, mergers, acquisitions, obsolescence of sectors of the work force and the increase in cross-skilled workers will continue to affect employees at all levels of the organization. Multiple careers and layoffs will be common and affect employee attitudes (Coates et al., 1991).

Due to the scarcity and cost of maintaining workers with critical skills, employers are turning to a contingent work force of temporary, part-time and contract personnel (Coates et al., 1991; Fletcher & Alic, 1991). Flexible schedules are appealing to a number of workers. Half the growth of the US labor force from 1980 to 1987 was in these categories of workers. Advances in telecommunications and networking allow some workers to perform at locations detached from the worksite, such as their homes (Coates et al.).

**Workplace Training And Development.**

The three major challenges in this decade are how to provide lifelong, efficient and effective learning (Cohen, 1991). Although the long-term solution to worker literacy is in America's educational system, the workplace cannot afford to wait. An educated work force will become a matter of survival (Feldman, 1991). As such, industry must prepare to develop its own continuing education programs (Crawford & Webley, 1992). Training employees to assume new roles and adapt to new technologies and work organizations is strategic to the business organization that wishes to meet the
challenge of the emerging marketplace. These organizations will also use training to increase motivation and commitment to company goals (Fletcher & Alic, 1991).

Learning organizations must learn to look at a complex business environment and pinpoint the issues critical to business competitiveness. They must be proactive rather than reactive. They must be able to determine future job requirements and upgrade work force abilities to meet these requirements. They must continually rethink what is meaningful work and provide the worker with the flexibility to make frequent career changes. They must help the work force embrace lifelong learning, develop a global viewpoint, learn to use the new technologies and work environments and shape business ethics and humanity (Lynch & Kordis, 1991). Learning organizations must place more emphasis on cost accounting procedures and utility analyses to demonstrate the return on investment for training. Increased validity and effectiveness of training at lower cost and reduced time frames are necessary (Cohen, 1991).

Due to the pressure for training and retraining to meet these new skill requirements, cuts in corporate training budgets are not likely to occur. Managers and executives are being exposed to innovative training methods to impact effectiveness in leadership and productivity. Corporate trainers are exploring faster, more efficient training delivery methods such as interactive video, audio tapes, videodisks, computer-based instruction and expert systems (Coates et al., 1991). Current training technologies include teleconferencing, video, computers and optical laser discs. Combining these technologies can produce realistic simulations through interactive videodisks for training, testing and diagnosis. Virtual-reality training is also becoming reality in the training technology set (Cohen, 1991).

Emphasis will shift to lifelong learning and flexible, just-in-time training models. Training must become more efficient as qualified workers become fewer and job changes more frequent. This demand for efficiency will find that taking training to the
job site is less costly than taking workers to the training site. It also allows for more real-time assessment of worker competency levels, thus making it more adaptable to changes in the workplace. The costs to replace ill-prepared employees can be substantial, better than $60,000 for a first-level supervisor. Efficient training intervention as an alternative to replacement can produce considerable savings (Cohen, 1991).

As the qualified work force becomes scarce, organizations will have to assimilate workers traditionally considered unemployable. Large disparities in knowledge, skills and abilities in this worker pool will call for standardization of competency levels and the establishment of minimum standards. Competency norms will become more flexible and realistic. Emphasis will shift from group to individual training. Just-in-time and remote training with different training events and exercises to match different people to the same job will be necessary. Greater use of adaptive training models will occur. These models allow training branching to occur based on responses at a certain level. Competency assessment and remediation can also use these models (Cohen, 1991).

One popular approach to training is the functional context approach, where instruction is in context with the work environment (Feldman, 1991). Organizations will have to maximize their use of employees' capabilities and skills. Employees will have to learn to adapt to continuous change and diversity in the work force. As employee skill norms lessen, training will place more emphasis on general aptitude for learning. It will emphasize competencies instead of being job-specific. It is likely for training to act as a screening device to eliminate the unqualified candidates from the potential worker pool while identifying strengths and weaknesses in the new hires. Highly valued employees will exhibit innovation, creativity, and the ability to learn a host of different subjects quickly and efficiently. Because of a diminishing labor supply, organizations will match individuals to jobs based on the best alignment of
required competency sets. Training also becomes a diagnostic tool as the matching of competencies and job requirements also points out areas for additional job and career training. Adding to previous learning in order to proceed to new tasks will be the order of the day. The business place will ask workers to accept greater responsibilities and perform more problem-solving and decision-making (Cohen, 1991).

In addition to traditional management skills, managers will need to acquire abilities in strategic planning, self-management, reality-checking and ethics as well as demonstrate versatility and courage. They will become mentors and teachers for their subordinates, providing continuous on-the-job training to meet these demands. Trainers will become critical resources for managers to learn essential facilitation and training skills. Training and development are essential to meeting the demands of the emerging workplace. Just as the workplace is rapidly evolving, training must adapt to the new requirements and embrace and advance new training techniques and technologies that couple lower cost with higher efficiencies (Cohen, 1991).

The need to place more emphasis on training in the nineties continues to grow as pressures on business are mounting. To remain competitive, industry is installing new equipment and implementing new technologies and programs (Horton, 1984; Kulp, Childs & Schumacher, 1978). The need to meet and surpass competitive pressures through cost control and improved productivity is paramount (Bjorkquist & Murphy, 1987; Schwaller & Slipy, 1985). Regulatory and licensing bodies are increasing the emphasis on training and documentation (Bloom & Levin, 1987; Schneier, Guthrie, & Olian, 1988).

Gordon (1991a) says that in 1990 the American Society for Training and Development (ASTD) announced that an additional $15 billion annually needed to be spent on training in American business. For at least the next decade, job redesign, training and retraining will be a significant economic challenge. To be effective,
training and retraining must prepare people for jobs that really exist or are in the process of change.

Training must produce learning worthwhile to the business entity in an efficient and effective manner. Worthwhile learning may be improved skills, knowledge, attitude, morale or even attending a particularly coveted seminar or convention as a reward for employee performance or contribution (Brinkerhoff, 1987).

**Accountability**

To meet these training pressures, performance-based quantification of employee skill levels and training needs is in demand. Quantification is necessary to cost justify the training investment as a means of generating productivity benefits (Ludeman, 1991; Schneier et al., 1988). Complementing quantification of training objectives is evaluation. Measuring how well training programs are meeting participants' needs is at the heart of the evaluation process (Fast, 1975). Unless accountability through evaluation is incorporated in the training process, program improvement cannot be undertaken (Brinkerhoff, 1987).

Due to government regulations, changing workforce needs, increased global competition and technological advances, increased attention is being placed on the impact of training and development on the organization (Grider, Capps, & Toombs, 1990). Mounting cost pressures are driving management to require more substantive demonstrations of the contribution of training to the organization (Carnevale & Schulz, 1990b; Essentials, 1993; Grider et al.). Evaluation needs to provide enough information to demonstrate that program and organizational objectives are being met (Carnevale & Schulz, 1990a).

Two-thirds of the training managers indicated increased pressure to relate training to the organizational bottom line. Included in the list of most popular reasons for training evaluation is to demonstrate its worth to the organization. Top management
usually determines the overall budget resources for the training department. Without accountability, it is difficult for the training department to command additional resources (Carnevale & Schulz, 1990b).

Training evaluation serves many purposes. These include (a) determining value added, (b) determining how well outcomes match objectives, and (c) identifying shortcomings in the curriculum (Garavablia, 1993; Essentials, 1993). Garavablia adds that follow-up evaluation can be used to identify what assistance participants may need after returning to the job and what barriers may be affecting learning transfer. Essentials says that a follow-up can be used to reinforce key learning points. He continues that evaluation can be used to determine the appropriate program participants and determine whether to continue or discontinue a program. Bushnell (1991) reinforces this last point. He says that training directors need to use evaluation to help balance program costs with results.

Evaluation can be performed with different methods: (a) observation and simulation, (b) pre- posttests, (c) follow-up tests, (d) interviews, (e) questionnaires, (f) surveys, (g) evaluations, (h) professional opinion, and (i) productivity reports and cost analysis. The approach chosen should match the type of training and the focus of the evaluation (Essentials, 1993).

Although organizations emphasize training that is relevant and cost-effective, managers base many training decisions on their perceptions of what training is worthwhile. Thus, many programs exist because of tradition. Line management determines better than 75% of the training program mix. This is where the most interaction with performance needs and training intervention occurs. Where broad-brushed policy or initiatives are involved, top management initiates the programs (Carnevale & Schulz, 1990b).
Evaluation

Purposes Of Training Evaluation.

Easterby-Smith and Mackness (1992) identify four purposes for training evaluation: (a) proving, (b) improving, (c) learning, and (d) controlling implementation. Proving relates training to desired outcomes. Improving uses feedback to strengthen course quality. Learning means that some skills, knowledge and attitudes (SKA's) are imparted to the trainees. Evaluation also helps control the implementation of a training initiative.

The end result of training is to produce desired job performance: a change favorable from performance prior to training. Effective training should: (a) produce the desired learning, (b) generate satisfaction with the training process, and (c) provide useful benefits to the organization. Ultimately, training should be evaluated by how much it contributes to the profitability of the organization (McDonald, 1987). According to Ban and Faerman (1990), training evaluation should focus on whether the training did cause the desired workplace changes.

Evaluation not only tells us if our goals were met, it also tells us whether the job can be done better the next time (McDonald, 1987). Ingols (1987) asks how future programs can incorporate improvements if training managers do not obtain a good evaluation of their current programs.

Brinkerhoff (1987) says that programs do not pay off when: (a) participants do not leave with intended SKA's or reactions, (b) learned SKA's are not applied to the job, and (c) expected organizational benefits are not achieved.

Levels And Stages.

One of the most quoted sources on workplace evaluation is Kirkpatrick. He describes four levels of evaluation, beginning with the simplest, as: (a) reaction, (b) learning, (c) behavior, and (d) results (Kirkpatrick, 1975a).
Hawthorne (1987) restates Kirkpatrick's four levels. He says that corporate education evaluations have asked four questions:

1. Was the training enjoyable?
2. Did learning take place?
3. Did training contribute to performance improvement?
4. What return on investment (ROI) did the corporation realize?

McDonald (1987) adds another question. He asks if the performance outcome of the training is the same as the intended outcome.

Easterby-Smith and Mackness (1992) add a level at the beginning. They state that the general view of evaluation is that it begins with course objectives. It then monitors reactions, learning, on-the-job behavior and organizational benefits.

Another well-referenced author in the area of workplace evaluation is Brinkerhoff. Brinkerhoff (1987) adds two levels to the front end of Kirkpatrick's four, in what he calls the Six-Stage Model. Stage I evaluates needs and goals. It determines if training is the proper intervention, what its intended outcomes are and whether the outcomes are worth the investment. Stage II evaluates alternative training designs and selects one that is practical, based on sound educational principles and cost-effective.

The next four stages conform to Kirkpatrick's four levels. Stage III evaluates the program operation. This stage implements process evaluation procedures and gathers reaction feedback on process effectiveness. Stage IV evaluates learning. Were the objective SKA's or reactions acquired and to what extent? Stage V evaluates usage and endurance of learning. How much of the acquired SKA's or reactions are transferred to the workplace? If no direct transfer is expected, are anticipated intermediate results obtained? The final stage, VI, evaluates the payoff. Did the program produce value to the organization in excess of the cost to produce it? Was the
effort to produce the value the most efficient and effective approach? (Brinkerhoff, 1987)

Brinkerhoff's (1987) model is dynamic. One stage does not shutdown before another begins. Several stages may be operating at the same time. Lessons learned in later stages are recycled into predecessor stages for program improvement.

Essentials (1993) identified five levels of program evaluation: (a) reaction, (b) learning, (c) attitudes, (d) behavior, and (e) results. These are the four levels of Kirkpatrick plus attitudes, whether the employee or the work environment embrace the training methods or concepts.

Basarab and Root (1992) relate the first two Kirkpatrick levels of evaluation to formative evaluation, the improvement of a program during development and implementation. Formative evaluation concerns those involved in program design, development and delivery. Level 1 provides evidence of program merit by documenting participants' feelings. Mastery of learning objectives is demonstrated at Level 2. Summative evaluation is related to the last two Kirkpatrick levels of evaluation. Level 3 documents program impact on job performance while Level 4 evaluates the impact on the organization.

This study will not be directly concerned with evaluating the training design. Combining the other components of evaluation listed above, the following items need to be considered:

1. Program needs and objectives.
2. Training process.
3. Learning acquired from training.
4. Learning transfer to the workplace as it relates to the original objectives.
5. Return on training investment. Did the value added warrant the organizational investment for training?
Program Needs And Objectives.

According to Dumas (1992), in the academic environment, the curriculum is driven by the teacher's knowledge. In the workplace environment, the curriculum is driven by what needs to be done to add value to the company. Hawthorne (1987) points out that an inadequate problem definition results in inappropriate evaluations. Clear, measurable goals with a manageable number of outcomes will assist in designing the evaluation.

Before a successful training program can be designed and evaluated, one must define the successful performance outcomes desired from the program (Gordon, 1991b). Effectiveness in management training and development is measured by how much the needs gap is reduced. This requires that training needs be identified (Endres & Kleiner, 1990). Both agree that good needs assessment is critical to developing an effective evaluation.

Headricks (1983) infers that needs assessments detect learning needs and interests. Schneier et al. (1988) note that needs assessments provide the foundation of effective training programs. Training needs exist throughout all levels of the organization to include salaried, management, technical, professional, clerical, wage and contract. In the aggregate, needs assessments point out the gap between where performance levels are and where they need to be. These needs may be for the current or the future workplace. The results of needs analyses are used as the basis for developing training programs to narrow and eliminate that gap.

A needs analysis is generally based on an analysis of job tasks. A detailed job task analysis to identify training needs can cost significant time and effort, providing more data than that needed to make curriculum decisions (Bloom & Levin, 1987; Kulp et al., 1978). Such a significant demand on resources will conflict with other organizational priorities and commitments (Headricks, 1983; Horton, 1984). A training needs analysis
may also fall prey to the politics of managerial biases and skepticism (Schneier et al., 1988; Schwaller and Slipy, 1985). Poor planning, lack of managerial education about the process and conflicting training fads can seriously hinder an analysis program (Schneier et al.). Because of these pressures, it seems important not to over analyze; to gather just the appropriate data to measure the gap between the actual and the desired.

**Reaction To The Training Process.**

At this level, the evaluation determines to what extent the participants liked the program, instructor and learning environment (Essentials, 1993). It provides an indication of whether the training environment was conducive to a positive learning experience (Carnevale & Schulz, 1990a). Jones (1991) lists the most common reasons for using reaction sheets for course evaluations as: (a) wanted by sponsors, (b) training staff wants feedback, and (c) numerical ratings carry an air of validity. Though considered the weakest method of evaluation, negative reaction level feedback indicates a training problem that will most likely result in little learning transfer to the job site (Connolly, 1991).

Adult education institutions have used participant evaluation forms based on the belief that the participants are best able to judge the value of the program as it applies to them (Reeves & Jensen, 1975). The reaction level evaluates how well trainees liked, or felt about the course. It is easy to measure and, therefore, used by most training organizations. For courses that consist of numerous sessions, comment sheets handed out early in the series will provide the trainers with the opportunity to make mid-course corrections. A reaction sheet can also provide feedback to the sending organization for external training programs, including universities (Kirkpatrick, 1975a).

The post-course questionnaire is the most common form of Kirkpatrick's Level I reaction evaluation. This generally takes the form of questions employing a rating scale and some open-ended written responses. This instrument is designed to obtain
feedback concerning course content, materials, workload, process, presentation style, course objectives, attainment of course objectives and overall value to the participant. One must be careful to screen out participant and organizational bias in the questions wherever possible. Reaction responses are subjectively-based and will always require an interpretation to a certain extent (Endres & Kleiner, 1990). Brinkerhoff (1987) notes that evaluation sheets may take the form of open-ended self-assessment scales that are general in nature. They also may use learning objectives as the basis for the self-assessment.

Referring to Kirkpatrick's Level 1 evaluation, Gordon (1991a) says that reaction sheets measure initial customer satisfaction. The reaction sheet should not pretend to provide data at higher levels of evaluation. McDonald (1987) says that asking about intention to use learning upon returning to the workplace can be answered as either yes or no. There is only value in the no answers.

According to Kirkpatrick (1975a), the usefulness of the reaction sheet is founded on the concept that maximum learning takes place when the trainees are motivated and the course is interesting. Although the reaction sheet measures whether the climate was favorable for learning to take place, it does not measure if learning took place or whether it directly created positive change in trainee behavior in the workplace. Even though the reaction level does not assess learning or transfer of learning to the job, most training is assessed at the reaction level (Carnevale & Schulz, 1990a).

Kirkpatrick (1975a) gives us some standards that should be applied to the design of reaction evaluation forms. First, know what it is that you want to measure. What are your objectives? Second, design a form that can be quantified and tabulated. Third, keep the form anonymous to encourage candid responses. Finally, allow for written comments to address additional areas of trainee response.
In Fast's (1975) experience, most students indicate that they are pleased with their
courses when completing their evaluations. When they do indicate that something was
unsatisfactory, the explanation is tailored by their momentary mood, their
transportation schedules and their ability to articulate. When everything is satisfactory,
what guidance is provided for improving the course? Reaction evaluations do not tend
to delineate training strengths and weaknesses enough to fine tune course material and
instruction.

The reaction sheet responses can be inordinately influenced by good showmanship
on the part of the instructor (Kirkpatrick, 1975b). To offset the influence of a very
dynamic trainer, a trained course evaluator may also critique the course. In this case,
the trainee and evaluator evaluations are combined (Kirkpatrick, 1975a).

McDonald (1987) says that satisfaction as a measure of learning can be obscured
by external factors such as location and incentives for using the training. Brinkerhoff
(1987) notes that objective responses on a reaction sheet require a low level of
organizational threat and coercion.

**Acquired Learning.**

Learning evaluation determines the immediate results of the program. This
evaluation should be discriminating enough to point out how well different program
objectives were met (Brinkerhoff, 1987). This level of evaluation determines whether
learning took place. It assesses whether information and skills were understood by the
trainees, not whether they can apply them in the workplace. This level is more difficult
to measure than reaction. Design, analysis and interpretation of evaluation data is time-
consuming (Kirkpatrick, 1975b).

The amount of effort and resources to accomplish learning evaluation is a function
of the context and needs of the particular program being evaluated. Evaluation ranges
from precise 100% correct responses needed in certification programs that have high
risk associated with nonconformance to general skill and information programs that carry low risk of loss for nonconformance (Brinkerhoff, 1987).

Brinkerhoff (1987) delineates the purposes and uses of learning evaluation:
1. Accountability. Did the program deliver what it said it would?
2. Unintended results. Are there positive and negative results other than what were listed as course objectives?
3. Mastery of learning. How much did the trainees learn? This provides feedback to the students and the trainers as to how well the program succeeded.
4. Planning for transfer of program objectives to the workplace. What skills were mastered, which ones were not fully developed?
5. Planning for follow-up evaluation. Points out areas of weakness or concern that warrant follow-up in the workplace.
6. Marketing HRD. Data collected in this level can be aggregated to demonstrate the services that HRD provides through its training programs.

Kirkpatrick (1975b) lists elements that should be considered when designing for effective learning evaluation: (a) quantitative measurement, (b) pre- and post-session evaluations, (c) objective measurement, (d) use of learning control groups, and (e) statistical evaluation to determine whether changes are statistically significant.

Brinkerhoff (1987) provides a list of useful learning evaluation methods:
1. Achievement tests. Measure learning outcomes from a program. Used to assess skills and applications.
2. Interviewing. Useful for assessing reactions and attitudes.
3. Knowledge tests. Samples the domain of knowledge that should have been acquired from the program.
4. Performance tests, simulations and role plays. Assess specific skills through responses to contrived on-the-job situations.
Kirkpatrick (1975b) segregates learning evaluation methods into two general techniques. The first measures learning through classroom performance. It is used to evaluate skills training. It includes demonstrations, discussions, and role-playing designed to demonstrate learning transfer. The second measures learning with written tests. These measure learning of principles and facts as opposed to skills and techniques. McDonald (1987) indicates that the amount of learning can be assessed with numerous available instruments. Kirkpatrick (1975b) observes that standardized tests are available but they may have to be tailored to the course. In many cases, the training organization will have to develop its own.

Brinkerhoff (1987) suggests attention be given to the following guidelines of design:

1. Provide feedback to trainees.
2. Choose evaluation methods appropriate for need for accuracy, precision and level of risk.
3. Use evaluation data to enhance the program.
4. Protect rights to privacy and confidentiality.
5. If the material is important to learn, test. Design the test with care and professionalism to overcome aversions to being tested.
6. Clarify the learning objectives and measure appropriately.
7. Simulate working conditions as much as possible.
8. Make maximum use of the evaluation data: (a) feedback, (b) program revisions, (c) planning for transition to the workplace, (d) marketing of HRD, and (e) developing cost/benefit comparisons.

The end-of-course test is used to determine if the requisite skills, knowledge and attitudes have been acquired (Connolly, 1991; Essentials, 1993; Smith & Merchant,
Learning evaluations must specifically address the key content presented in the program that the participants are required to learn. The best tests are customized to the specific program (Essentials, 1993). Pretests can be used to determine how much impact the training contributed to the participant's skills, knowledge and behaviors (Connolly, 1991).

These evaluations provide feedback for the improvement of the training program while making the participant accountable for the learning. The use of testing encourages participants to attend sessions, review materials and concentrate on developing required competencies (Smith & Merchant, 1991).

**Learning Transfer To The Workplace.**

Although pre- and posttests improve upon reaction sheets and learning assessments measure whether learning took place, neither indicate successful transfer to the job environment (Carnevale & Schulz, 1990a; Erickson, 1991). The best measure of successful training is whether participants are able to meet specific job-performance goals (Feldman, 1991; Garavablia, 1993).

Kirkpatrick (1975c) points out that knowing about skills, techniques and principles does not presume that the trainee will convert knowledge to behavior in the workplace. This level of evaluation is more difficult than evaluating learning.

Behavior evaluations measure the transfer of behavior or performance from training to the job. Sometimes called follow-up evaluations, they are used to measure retention, identify the amount of improvement in key areas and compare on-the-job with end-of-program results. They require the collection of quantifiable data (Essentials, 1993). Brinkerhoff (1987) explains that transfer evaluation is aimed at determining what SKA's acquired during training are correctly incorporated into job
performance. The logic underlying this stage of evaluation is that training was performed to provide a direct benefit to the organization.

There are several purposes for transfer evaluation. One is to determine the effectiveness of the training transfer to the workplace. It may indicate the need to modify or revise the training to increase its effectiveness. Another is to determine intervention needs and strategies where particular individuals have not achieved significant transfer to the workplace. Direct intervention through additional training or on-the-job mentoring may be necessary. Another is to evaluate the effect of training on the organization. Finally, there is the documentation of the effects of training. Documentation is used to indicate the effectiveness of the training, market the effectiveness to the organization, establish a written basis for the next higher evaluation level and provide a data base for further research and evaluation (Brinkerhoff, 1987).

There are various degrees of accountability at this level of evaluation. The most directly assessable are those concerning hard, observable job skills. Softer acquisitions are in behavioral or motivational training. Softest yet are those acquired under company-sponsored continuing education programs aimed at employee self-development (Brinkerhoff, 1987).

Brinkerhoff (1987) tells us that, based upon the objectives of the training and the degree of softness, various evaluation strategies may be employed. These range from measuring hard data to indirect observation of the environment to indications of change:

1. Behaviorally-anchored rating scales.
2. Follow-up questionnaire. Parallels the end-of-course questionnaire at some time after the trainee returns to the workplace.
3. On-the-job interviews.
4. Observation in the workplace.
5. Performance appraisals data. Useful only where the particular training SKA's are evaluated.

6. Artifacts analysis. Observing changes in habits and work practices that are indirectly related to the impact of the training.

Dumas (1992) says that one method of evaluation is to contact trainees after they have returned to the workplace and ask for instances where the training has contributed to significant improved performance or results.

Attitude evaluations measure employee feelings, emotions, values, beliefs and opinions toward their jobs, workplace, subordinates, peers and supervisors. They can be used to measure changes in attitude brought about by the learning experience.

Traditional evaluation techniques are questionnaires, interviews and observation.

Attitudes can be assessed using essay questions asking the participant to respond to a stated problem. Use numerical scales to quantify subjective areas such as feelings and interests (Essentials, 1993).

On-the-job application can be assessed through reported or observable measures. Reported measures include questionnaires, telephone interviews and critical incident reports from trainees, their subordinates and their supervisors. Observable measures include the examination of records, outputs and job-site observations (Connolly, 1991).

Various methods of collecting this data are: (a) on-the-job observations, (b) examination of performance reports, (c) progress on training-related performance action plans, and (d) responses from trainees, subordinates, peers and supervisors (Essentials, 1993; Garavablia, 1993). Essentials notes that self-reports and performance appraisals are the least used methods. It suggests using unbiased collectors of information wherever possible and the use of pre- and posttests and control groups to isolate performance changes due to training.
Essentials (1993) proposes the following guidelines for conducting a follow-up evaluation:

1. Let participants know during the training that a follow-up may be performed and, if so, that it is mandatory.
2. Evaluate knowledge and performance consistent with the training program.
3. Determine causes for areas with minimal learning transfer.
4. Share the results with each participant's supervisor.
5. Assign follow-up activities where needed.

Essentials (1993) continues to say to be sure to involve management in developing the evaluation criteria, determining the data collection method and identifying and reporting significant results. It is important for organizational buy-in to involve those who are program sponsors, advocates and beneficiaries in the evaluation.

Kirkpatrick (1975c) states that performance evaluation should be solicited from as many groups as possible: (a) self, (b) peer, (c) subordinate, and (d) supervisor. In order to determine relative significance of training transfer, he advocates a systematic workplace pre- and post-training evaluation. This is followed by a statistical analysis of the before and after evaluations to determine if course effects are statistically significant. He stipulates that a minimum of three months should separate training and evaluation to provide the opportunity for the trainee to modify behavior. Finally, he encourages the use of a control group to give validity to the statistical analysis. He continues that the measurements must be made in as scientific and statistically-usable terms as possible. This may require the assistance of statisticians, researchers and consultants.

Sometimes, training is for avoidance of problems, such as in safety and regulatory training. The training may never translate into measurable job performance changes (Brinkerhoff, 1987). Actual use and effects of use are affected by application
difficulties, opportunity, and job environment factors external to the learner (McDonald, 1987). Gordon (1991b) also cites Kirkpatrick that soft skills training may not work for everyone who takes it. Therefore, an evaluation that shows transference to the workplace did not take place is not necessarily a negative. It may be because of a conscious choice between existing and learned alternatives that best fit the individual.

**Return On Training Investment.**

The highest level of evaluation is the results level. Results evaluations measure how much value the organization received from training. Results at this level are usually in organizational terms that quantify the dollar impact of training. On-the-job behavior change that is in conflict with organizational goals will not translate into organizational results (Carnevale & Schulz, 1990a; Connolly, 1991; Essentials, 1993).

Stage VI analysis determines whether value from training has been realized by the organization and whether the cost of training was justified. It also determines whether the training intervention actually addressed the organizational need and whether other alternatives may have been more productive or are still needed. This stage goes beyond whether SKA's were successfully imparted to the employee. It asks if the company acquired organizational benefits in excess of the training investment. It may be that the training directly or indirectly modified SKA's that do not impact the initial organizational objectives (Brinkerhoff, 1987).

Brinkerhoff (1987) gives some useful procedures for Stage VI analysis:

1. Case studies of actual training-related organizational changes.
2. Customer surveys.
3. Cost-Benefit analysis. This analysis first evaluates the cost to produce desired effects under various alternatives. The benefits to be gained under each alternative are then weighed against the respective cost.
4. Performance records analysis. This is a before-and-after analysis of relevant performance indicators.


6. Performance audit.

7. Return on investment analysis/payback period. Financial ratios that relate realized return to total investment and cost to produce the realized return. The financial returns are usually on an after-tax basis.

Evaluation should be measured in terms of results. Training programs should state their objectives in terms of measurable results desired if results evaluation is to take place. Where the results are easily quantifiable, evaluation is relatively straightforward. Because of the effects of external factors, the linkage of training to results is often difficult. The literature dealing with results-oriented design and application by 1975 is sparse due to the complexity of designing the evaluation. Most before and after studies do not attempt to separate external factors when linking training to results (Kirkpatrick, 1975d).

Many of the studies cited by Kirkpatrick use a reaction sheet approach to evaluating post-training performance. Peers, supervisors, subordinates and the trainee are surveyed to determine if changes in the learning areas were noted. The object is not to test the knowledge of the trainee but the performance as observed from as many vantage points as possible.

Usage of Evaluation Levels in the Workplace

Where reaction level evaluations are easy to gather, they are not indicative of a program's value. Results level evaluations are more difficult to collect but help assess the program's organizational impact. Managers tend to favor the behavior and results levels since they indicate the impact on the job and the organization. Trainers prefer
reaction and learning levels because they address training delivery and content (Carnevale & Schulz, 1990a).

Grider et al. (1990) performed a survey of 1,200 randomly selected members of the American Society for Training and Development to determine which evaluation methods they perceived to be most effective and which ones they used most frequently. The survey represented a broad cross-section of industry both in size and industrial classification.

Grider et al. (1990) reported that, overall, the survey respondents indicated that they felt the three most effective evaluation methods were behavior, results and competency-based. Behavior and results evaluation methods correspond with the evaluation levels as defined by Kirkpatrick. The competency-based evaluation method measures softer skills such as problem-solving, planning/organizing and decision-making that fall into the management/self-management areas. There was some variation by industrial classification but not by organizational size.

Grider et al. (1990) also reported that reaction was the most often used survey method. Slightly more than half used a method other then the one they perceived to be the most effective. The reasons they cited were: (a) too expensive or time-consuming, (b) lack of expertise in the application, (c) preference for another method or no commitment from top management, and (d) unable to isolate training from other factors.

According to the authors' definitions, the behavior, results and competency-based methods use pre-training baselines to compare with post-training performance. In addition, they require hard data to assess for the training impact to be quantifiable. The time and cost of performing the assessment make it difficult for training departments to implement these methods. Attempting to develop hard data in soft training areas such
as management development compounds the difficulty. When selecting an evaluation technique, balance effectiveness with cost and ease of use (Grider et al., 1990).

**Design and Use of the Reaction, Behavior and Results Levels**

**Reaction Level**

Jones (1991) produces a rather extensive list of the faults inherent in reaction sheets. These include the fact that there is no clear correlation between reaction sheet ratings and performance on the job. In addition, there may be a delay in realizing training effects until some time after course completion. Among other areas of weakness are the subjectivity of the ratings, the variable background and experience of the raters, the tendency to overrate fun training experiences, fear of reprisal and desire of participants to complete the form quickly so they can leave at the close of the program.

McLinden and Cook (1990) point out two areas of weakness in the construction of reaction assessments. First, the 5-point Likert Scale normally used to measure participant reactions is too compressed to develop meaningful differentiations. Most respondents do not use the two extreme points on the scale such as excellent and poor. This limits the responses to only the three middle scale points. Second, relative strengths and weaknesses between different assessment questions are difficult to assess. An instructor may receive a scaled rating of good while materials may receive a rating of fair. Does this mean that the materials were not as good as the instructor? Not if the assessment did not ask the participants to rate the instructor relative to the materials.

McLinden and Cook (1990) suggest that a reaction instrument that uses an expanded Likert Scale in conjunction with a series of paired comparisons can assist in developing greater discrimination within and between assessment items. Paired comparisons request the participant to make a choice between two assessment items.
When using a reaction sheet, Jones (1991) and McLinden and Cook (1990) suggest an emphasis on course objectives will improve the quality of the reaction sheet. Jones continues that questionnaires should be kept brief and acceptable limits of variation on measurable items should be established.

Essentials (1993) says that the best instruments are quick and easy to fill out and highlight the most important points. They give additional guidelines for constructing a reaction form:

1. Highlight specific program areas such as content, materials, environment, instructor, etc.
2. Do not use generic forms; design the form to match the course.
3. Allow for comments.
4. Do not require signatures.
5. Use numerical scales to quantify subjective reactions such as those dealing with feelings (i.e. good, fair, poor).

Behavior Level

For behavior level evaluations, Carnevale and Schulz (1990b) noted in the ASTD research that almost all of the companies recognized the importance of waiting some reasonable period after training, typically six months, before conducting a behavior level evaluation. The company of Johnson and Johnson sends out a self-report to participants six months after training. For management and supervisory trainees, their subordinates are surveyed annually for perceived changes in managerial performance. Garavablia (1993) reports that the general consensus is to measure training transfer from three to six months after completion of training, with six months being the median. Articles by Connolly (1991), Essentials (1993) and Poulet and Moult (1991) agree that the delay should be at least three months.
Basarab and Root (1992) generally call for pre-post job observation for all Level 3 evaluations. They call for post training evaluation to take place at 3 months, followed by one at 6 months. The delay is for training to take effect on the workplace. Kelley, Orgel and Baer (1994) note that when questionnaires are completed too close to the end of a course they may reflect participant expectations and not the impact on their actual longer-term job performance. According to Hale (1994), a rule of thumb for Level 3 evaluation is a minimum of 6 weeks and a maximum of 2 years.

Feedback can be collected from participants, supervisors, peers and subordinates, performance, work and accounting records and logs (Basarab & Root, 1992; Hale, 1994; Phillips, 1991) as well as customers (Hale, 1994). In order to add validity to the evaluation data, at least two different types of instruments should be employed, especially when collecting data from second-hand sources such as peers and supervisors (Basarab & Root; Hale; Phillips).

**Barriers to learning transfer.**

To be effective, training needs to address the correct performance area (Garavablia, 1993). It is also important to identify any individual or environmental factors that enhance or interfere with training transfer to the job-site (Carnevale & Schulz, 1990a; Connolly, 1991).

Performance deficiencies within the individual can result from lack of applicable knowledge, skills, attitudes and motivation (Garavablia, 1993; Quinn & Karp, 1991). Participant value systems, self-image, expectations and ambitions influence the level of identification, acceptance and implementation of training among program participants (Poulet & Moult, 1991).

Organizational barriers such as a lack of adequate workplace tools and facilities, unsupportive workplace personnel and management resistance to change also influence training transfer to the job (Garavablia, 1993; Poulet & Moult, 1991; Quinn & Karp,
Carnevale and Schulz (1990a) note that it is important that supervisory support be obtained for both the program and the employee prior to training participation.

One of the items Broad (1994) uses on a training transfer action plan is to identify significant barriers to transfer. Basarab and Root (1992), Norton and Bennett (1994) and Broad as adapted from Newstrom, 1985, delineate barriers to learning transfer that can be placed into four major groups. The first group is organizational barriers:

1. Organization does not support course objectives.
2. Performance of the objectives produced a negative result for the employee.
3. Organization does not allow use of the work objectives.
4. Employee supervisor does not support course objectives.
5. Employee peers do not support course objectives.

The second group is environmental barriers:

1. Employee job does not support the course objectives.
2. The physical work environment precludes application of the course objectives.
3. An historical event such as a strike, layoff, or other significant event occurred that influenced training transfer.

The third group is individual barriers:

1. Employee does not perceive the acquired SKA's as relevant or practical.
2. Participant did not acquire the learning objective.
3. Participant has forgotten the obtained learning objective.
4. Participant has not identified on-the-job applications.
5. Separation from instructional source removes support for application.
6. Hard for participant to accept change.
7. Lack of employee motivation.

The final group is course design and delivery:
1. Course did not provide the learning objectives or did not explain adequately.
2. Job does not require the learning objectives.

Factors influencing learning transfer

Broad (1994) cites two sources for factors influencing successful transfer of training to the workplace. He summarizes Baldwin and Ford. They list ability, motivation, the environment and the organization. Included in ability are the participant's physical ability to perform the learning objective and the participant's confidence in performing the objective. Motivation includes the participant's motivation to perform and the participants belief in the value of the learning objective. Environmental addresses the opportunity to use the acquired SKA's on the job. Organizational includes a supportive organizational climate and follow-up and feedback from the participant's supervisor after completion of course.

The other source cited in Broad (1994) is Feldstein. Feldstein's study identified learner and management change factors critical to learning transfer. Those associated with the learner are (a) attitudes and behaviors, (b) frequency of practice on the job, and (c) awareness of multiple applications for the new skills. Management factors include a general understanding of how the training can be used on the job and reasonable expectations for changed performance.

Three separate cases cited by Broad (1994) showed how an emphasis was placed on post-training debriefing, coaching, performance follow-up, recognition and trainee and administrative support by managers in order to positively affect training transfer. The trainees were expected to contribute to the collaborative process with their managers for coaching, action planning, follow-up, peer support, adaptation to the workplace and project completion.
Determining training transfer.

Basarab and Root (1992) and Phillips (1991) have developed lists of questions to determine whether and how much training has transferred to the participant's job. These can be categorized as identifying factors related to: (a) skill application, (b) environmental support, (c) organizational support, and (d) course content.

Elements of Basarab and Root's (1992) list that deal with skill application are:

1. Has the skill been performed in the workplace?
2. How was the skill used in the workplace?
3. Will the participant continue to use the acquired skill?
4. How many times has the skill been performed relative to the number of opportunities to perform?
5. How has the skill changed the participant's job?
6. Was the job impacted significantly, either positively or negatively?

Basarab and Root (1992) determine environmental support by asking what additional resources are required to perform the acquired skill, such as people, money, equipment and tools. The organizational impact is identified by asking what significant positive or negative organizational changes resulted from the training. Weak or missing course content is detected by asking what skills the participants had to acquire to meet the training objectives that were not met by the training. Finally, he asks the participant to identify any corrective actions that need to take place, either in the workplace or in the training program.

Concerning skill application, Phillips (1991) asks the participants to identify the extent to which they can apply their learnings to their jobs and how the program improved job performance. The organizational involvement is ascertained by asking the extent to which the boss is interested in the course learnings and whether the organization, either formally or informally, allows the learnings to be practiced.
Basarab and Root's (1992) questions dealing with course content are:

1. For each objective, rate how well the course achieved it.
2. Did the program meet overall needs?
3. What program features were most significant?
4. What modules had too much emphasis, too little?

His questionnaire also allowed room for written comments.

**Data gathering techniques.**

Some Level 3 data gathering techniques are the use of questionnaires, surveys (attitude), interviews (structured, in person, by telephone), job observation (pre-, post) and focus groups (Basarab & Root, 1992; Hale, 1994; Norton & Bennett, 1994; Phillips, 1991). In addition, the action plans group includes the action plan, performance contract and action plan audit (Basarab & Root; Norton & Bennett; Phillips). Phillips includes pre- and post performance tests and job simulations.

According to Hale, all techniques for gathering data can be summarized into the following approaches: (a) ask questions, (b) observe performance, and (c) examine documents.

Quantitative evaluations usually involve numerical data. When tied to business results, these evaluations use such methods as surveys, productivity measures and quality measures. Quantitative methods, however, do not measure such qualitative information as meaning, attitude or morale. This data is usually gathered with interviews, focus groups, observations and open-ended questionnaires. Much qualitative information is anecdotal, such as in examples of training applications on the job. A more comprehensive evaluation usually incorporates both the quantitative and the qualitative dimensions (Petrini, 1994).
**Questionnaires**

Basarab and Root (1992) say to use a questionnaire when the data is quantifiable and costs must be kept low. Do not use a questionnaire where the respondents have a low reading level or when the time to complete the evaluation is short. He continues that the questionnaire should be composed of course objectives and job tasks that result from the training. Make the questionnaire easy to read, comprehend, complete and return. Phillips (1991) emphasizes that the questionnaire should be based on training objectives. He includes pilot testing in his guidelines for questionnaire development.

Phillips (1991) lists two basic types of questionnaires. These are the open-ended, where a response is elicited from an unlimited selection, and the checklist, where the participant checks those responses that apply. Responses to checklists can be two-way, multiple-choice or ranking. Two-way only allows one of two responses such as in yes or no. Multiple-choice allows a selection from a list of responses. In ranking, a participant ranks a list of responses.

Basarab and Root (1992) and Norton and Bennett (1994) list several advantages to using a questionnaire:

1. They are short, simple and of low cost.
2. They can be completed and compiled at the convenience of the respondent and the evaluator, giving the respondent time to reflect on the answer).
3. They are easy to distribute, such as in the mail.
4. The fixed format lends to uniformity of response.

Phillips (1991) adds that questionnaires allow flexibility and support honesty through their anonymity. In contrast to Phillips, Basarab and Root and Norton and Bennett consider that, due to the nature of the close-ended responses, the fixed format of the questionnaire dictates inflexible responses.
Basarab and Root (1992) add that another disadvantage of the questionnaire is that written expression is not as good as oral expression. Phillips (1991) notes that the accuracy of the responses is not guaranteed. Basarab and Root, Phillips and Norton and Bennett (1994) all agree that there is a potential for a poor response rate when dealing with questionnaires.

**Action Plans**

Action plans require the participants to establish written action plans, during training, of those behaviors they want to try on the job. Generally, the instructor gives the participants lists of behaviors from which to choose. The participants then plan the action and reach consensus with the instructor. A copy of the approved plan is kept with the training department for later follow-up with each participant. When developing a workable action plan, one must take into consideration the time, resources, organizational constraints and impacts on other individuals. Planned actions must be observable if they are to be evaluated (Basarab & Root, 1992).

A follow-up is conducted at a later time to determine how well those behaviors were implemented. This approach asks whether job improvements resulted from the course design, how well the course affected job activity, and what, if any, barriers blocked learning transfer. Follow-up can be through questionnaires or interviews for either all or a part of the participants. Input can include peers, subordinates and supervisors as well as course participants (Basarab & Root, 1992).

Norton and Bennett (1994) list the major advantage of this method as the participant taking ownership in the skill transfer through direct involvement in planning for the transfer. He cites the major disadvantages as the time planning takes away from class, the follow-up required and the poor return rate when questionnaires are used.
Interviews

Interviews are used to obtain data that is either not available from other sources or is difficult to obtain through written instruments or observations. Interviews may be structured or unstructured. Structured interviews follow a specific format, using a fixed set of questions, and are designed to leave little room for deviation or informal responses. They are used to ensure that the questions are answered and the interviewer understands the participant responses. Unstructured interviews are used for probing. They use a few questions with no definite format. They are designed to elicit a response by letting the respondent open up subject areas for further discussion (Basarab & Root, 1992; Phillips, 1991).

Phillips (1991) cites the opportunity for clarification as an advantage to using interviews. In addition, the open-ended design allows for response flexibility (Norton & Bennett, 1994; Phillips). Norton and Bennett note several disadvantages to using interviews. They are subject to biased application and interpretation and they require scheduling of the interviewees. They also agree with Phillips that interviews are costly to administer. Basarab and Root (1992) echo Norton and Bennett in noting that interviews require training of interviewers to ensure consistency. Phillips says that interviews can be highly reactive. Finally, Norton and Bennett, Phillips and Basarab and Root cite that conducting interviews is time consuming.

Basarab and Root (1992) and Phillips (1991) say that interviews can be improved by:

1. Itemizing the questions to be asked and tying to the evaluation plan.

2. Pilot test with a sample of the target population.

3. Train the interviewers.

Basarab and Root add additional improvements to the list:

1. Review with subject matter experts.
2. Test with peers.
4. Give clear instructions to interviewees.

Finally, Phillips says that establishing and maintaining an interview schedule including timing, interviewer and location will improve an interview.

**Observations**

Observations involve observing a participant either before, during or after training has occurred and recording changes in behavior. Two basic forms of observation instruments are used. The behavior checklist is used to record the occurrence, frequency or duration of a specified behavior. Another method is to record a behavior code whenever the behavior occurs. This method is more time-consuming and requires more training of the observers. It is useful for documenting a sequence of behaviors or when the number of behaviors makes using a checklist difficult to use (Basarab & Root, 1992; Phillips, 1991).

Phillips (1991) lists several other types of observation instruments:

1. Delayed Report. The observer reconstructs behaviors at intervals or after the observation period is ended. It is less accurate but also less obtrusive.
2. Video Recording. It may be difficult to set up in a work situation or it may create too much apprehension in the participant.
3. Audio Monitoring. The monitoring of conversations, such as in sales call monitoring, to determine if training objectives are being met.

Norton and Bennett (1994) list two advantages of the observation method. The first is that behaviors are directly observed and documented. The second is that the observations are made within the framework of the job environment. He lists several disadvantages:

1. Costly.
2. Time-consuming.
3. Potentially disruptive.
4. Requires trained observers.
5. Observers may fail to record all occurrences.

Phillips (1991) adds that the reliability may be influenced by reactive or disruptive effects.

Basarab and Root (1992) and Phillips (1991) list two guidelines in developing an observation:
1. Observers must be properly trained to carry out consistent and unbiased observations.
2. Observers must be trained in how to interpret and summarize their observations.

Phillips adds three more:
1. Observers must have an opportunity to practice their observation skills.
2. Observations must occur at the appropriate times.
3. Observers must be as unobtrusive as possible, blending into the work environment as much as possible.

**Attitude Surveys**

Attitude surveys are complex instruments to design. Attitudes are difficult to measure because they do not always correlate with belief systems and behavior and can change over time. However, this does not preclude developing reasonable attitude data. The attitude survey is easy to process, administer and standardize but it is limited in response choices and does not guarantee honest responses (Phillips, 1991).

Phillips (1991) suggests the following development guidelines:
1. Involve appropriate management.
2. Collect only pertinent data.
3. Use unambiguous statements.
4. Ensure participant anonymity.
5. Communicate the survey purpose.
6. Use comparison groups or before-after comparisons.
7. Design for ease of compilation.

Tests

Tests are used to measure either aptitude, the ability to learn, or achievement. Achievement tests assess knowledge or competence and are used to measure training results. They may be presented through the following mediums: (a) written or oral examinations, (b) job simulations, (c) on-the-job performance, and (d) computer-based examinations (Phillips, 1991).

According to Phillips (1991), there are several basic test designs besides the oral exam and the essay. The objective-based design is oriented toward the objectives of the program. This design requires precise answers. It is not applicable to measuring attitudes, feelings, creativity, problem-solving ability or other intangible skills and abilities. The norm-referenced design scores test results relative to group norms or averages. Participants are ranked relative to the norm. Criterion-referenced test results are scored against an established standard, usually requiring a minimum score to demonstrate successful performance. Success is measured based upon mastery of instructional objectives. Finally, in a performance test, the participant exhibits a manual, verbal or analytical skill. This could be exhibited on the job with such methods as skill practices, projects or role playing. It is sometimes used to assess knowledge or attitude. The performance test is reliable and objective-based but it is time consuming and costly to develop and administer.

Phillips (1991) points out several elements critical to the successful design and administration of tests:
1. The test must be a representative sample of the course material for it to be valid.

2. Thorough planning including timing, participant preparation, materials, tools and evaluation is required.

3. Successful testing requires thorough and consistent administration including job aids and environment.

4. The conditions of performance and criterion for success must be developed and clear to the participants.

5. Performance requirements and responses should not be ambiguous.

Performance Records

Performance records are reliable, job-based and have a minimum of reactive effects. However, they rarely directly measure the SKA's the evaluation wants to measure, assuming the records exist at all. Where the organization keeps performance records that can be associated with training outcomes, the following guidelines are recommended:

1. Identify all record sources that are related to the performance objectives of the training.

2. If the population is large, develop an appropriate sampling plan. The sampling plan should represent the population, be randomly selected and, if possible, include a control group.

3. Where possible, convert records into usable data, such as in combining two sources to obtain an average output, if average output is the parameter being measured.

4. Create and implement a data collection plan, including responsibilities, sources and timing.

Where records do not exist, then the time and costs to develop a record keeping system must be taken into careful consideration (Phillips, 1991).
Work Output

Norton and Bennett (1994) list several advantages of an evaluation through the examination of work outputs:

1. It represents tangible evidence of the work product.
2. It establishes the consistency of the work product.
3. It highlights common deficiencies.

Norton and Bennett also list some disadvantages associated to this form of evaluation:

1. Deficiencies in the output due to particular participants may not be identifiable.
2. It does not provide information on the process used to produce the output.
3. It does not provide data on why product was not output.
4. There may be organizational or employee sensitivities to measuring the output.

Focus groups.

Focus groups are small discussion groups, conducted by a facilitator, used to elicit comments and judgments on focus issues. They are useful for assessing program quality or behavior changes resulting from a program. Focus groups are especially useful when simpler quantitative methods are not adequate for the information desired to be collected (Phillips, 1991).

Though time-consuming, O'Donnell (1991) states that focus groups can provide a depth of response that other evaluation techniques cannot provide. Six to twelve individuals who share some aspect of commonality associated with the evaluation compose a focus group. The ideal size is from eight to ten. With the help of a moderator, they discuss a topic and share thoughts, attitudes and opinions. The output of a focus group is qualitative data. They usually provide information different from that gathered in one-on-one interviews and yield greater depth of information due to
the group interaction. Use them as an alternative when no reliable quantifiable data is available. They are useful for identifying key issues and concerns among the participants.

Phillips (1991) notes a number of factors that will help make focus groups successful:

1. Plan the focus carefully.
2. Obtain management buy-in.
3. Use multiple focus groups that are representative of the population. A 5 - 20% representation is recommended. Stratify the population if necessary to keep individual groups homogeneous in makeup.
4. Keep group sizes within the boundaries of 6 to 12 participants.
5. Use experienced facilitators.

O'Donnell (1991) points out three phases in evaluating with a focus group: (a) planning, (b) conducting, and (c) analyzing and reporting. The planning phase identifies and defines the problem, identifies the participants and produces the discussion guide. It is important not to include participants' supervisors in the group and to limit questions from three to four so as to keep the meeting to either a one or two hour limit. While conducting the actual meeting, the moderator is responsible to guide the discussion. The moderator's participation in the actual discussion should be kept to a minimum. It is important that this individual not have a vested interest in the discussion. Stress the confidentiality of participants' responses so as not to discourage participation in the discussion.

To assist in the analyzing and reporting phase, it is useful to develop a full transcript of the meeting. After the discussion, analyze the responses for areas of commonality and subcategorize these areas wherever possible. Be sure to interpret rather than editorialize. Publish the final report in writing (O'Donnell, 1991).
Phillips (1991) lists several advantages of focus groups:

1. Inexpensive and easy to administer.
2. Uses group process to stimulate feedback from members.
3. Flexible interview process allows for qualitative responses through probing and the development of unexpected insights.

He lists two disadvantages:

1. Sensitive to the skill of the facilitator.
2. Their subjectiveness may be difficult to summarize.

**Case study.**

In order to evaluate long-term relevance of training, Erickson (1991) was involved in developing a series of case studies that distilled course competencies that would be used to assess job knowledge three to six months after program completion. The participants were asked to respond to each case study and were scored on their ability to demonstrate knowledge of the competencies needed to resolve problems represented by each case. Evaluators were subject matter experts and were supplied with checklists of the competencies being tested. The interviews were taped and impartial evaluators independently scored some of the interviews as a control on the original scores. This method pointed out areas of overall weakness in response that could then be investigated for association to such areas as course material, instruction, case ambiguities or job environment.

**On-the-job training.**

Interestingly, Garavablia (1993) reports that formal training usually accounts for only 20% of critical skills learning. The remainder of this learning comes from the job or organizational systems.
Results Level

This is the most difficult method of training evaluation because of the difficulty in identifying highly measurable organizational factors and isolating the impact of training. Many variables can be affecting outcomes over the same time frame (Connolly, 1991; Essentials, 1993). Because of the difficulty in making direct measurements of training effectiveness, results may be expressed as improvements in selected organizational indicators (Carnevale & Schulz, 1990a). Because of the difficulties, many organizations do not attempt to conduct results evaluations (Essentials).

In conducting a results evaluation, try to isolate the training effect from any others and be aware of the Hawthorne effect: an increase in performance brought about by being a part of the intervention but not directly related to the intervention. Use a control group to help eliminate the effects of variables external to the training. Use pre- and post-training tests to measure the impact on the organization. Organizational measures can include errors, absenteeism, production, grievances, complaints, etc. These evaluations require hard data (Essentials, 1993).

It is sometimes useful to infer compliance with organizational objectives through how well teams or departments meet their objectives. The underlying assumption is that lower-level organizational objectives support the overall organizational objectives (Carnevale & Schulz, 1990a).

Looking at results-oriented evaluation, Carnevale and Schulz (1990b) describe several practices. At Vulcan Materials, middle managers are asked to estimate the savings they expect from a training program and the percentage level of confidence they have in achieving their estimate. The two figures are multiplied to obtain a weighted forecast. After program completion, an evaluation is made of actual cost savings. Managers are asked to indicate the percentage that they attribute to training. This is compared to the weighted forecast they produced earlier.
Carnevale and Schulz (1990b) continue that at Johnson and Johnson and Motorola, training programs that were part of organizational initiatives share credit for any savings. These conclusions are not based on any rigorous research methods and can be more easily inferred in production environments where performance measures can be more precise in identifying change. Polaroid bases projections for savings from training on units that are standard to the organization, such as production per hour. However, there is little rigorous statistical support for these claims other than past or similar experiences.

Multiple Evaluation Sources

Relying on only one method of evaluation within an organization will lead to using the wrong technique to gather evaluation data. It also tends to preclude the need for establishing evaluative criteria during the construction of a training program (Beer, 1990). Carnevale and Schulz (1990a) recommend the use of multiple data sources to provide a more complete view of training results. In addition, Jones (1991) recommends on-the-job follow-up studies that include multiple information sources and the measurement of observable behavior, where possible.

The Travelers Companies use reaction sheets, evaluator observations and follow-up group discussions with course participants. New England Telephone uses a combination of reaction sheets and focus groups. It administers reaction sheets at course completion and three months after training. Line managers receive a reaction sheet to respond to on the effectiveness of the training in meeting their mission. Focus groups occur several months after training and include instructors, evaluators, instructional designers, managers and participants. The object of the focus group is to increase the effectiveness of the program and content (Carnevale & Schulz, 1990b).

Carnevale and Schulz (1990b) add that, at Xerox, the data collection sources for evaluation include post-course group discussion, one-on-one and telephone interviews,
questionnaires, job record examinations and post-training interviews with related managers. In addition, it conducts on-the-job performance evaluations to validate other data sources and identify any barriers to learning transfer that the job environment may pose. AT&T uses judgment from line managers and experts, coupled with a trainee self-report form to measure course reaction and perception of training contribution to job performance and career development.

Beer (1990) reports on an extensive program at a high technology company to educate managers on multiple evaluation techniques, to include when they should and should not use them. The company pursued this effort because of an over-dependence on surveys as a means of training evaluation. The program placed much more attention on formalized evaluation planning. In the end, the use of evaluations expanded, including surveys. It proved very difficult to reduce the reliance on surveys as a common evaluation instrument.

Developing An Evaluation Design.

**Evaluation Objectives**

Carnevale and Schulz (1990b) report current evaluation practices at the companies in the ASTD research. One common thread running through the report is that these companies spend considerable time during course design and development to establish specific training and evaluation objectives. It is against these objectives that they measure the success of the course.

Basarab and Root (1992) note that a complete course description is necessary to conduct a successful evaluation. Included in this course description are goals, understandable and measurable objectives, content and curriculum sequence. The objectives must be stated in such terms that they can be measured. The evaluation should be non-threatening to all parties involved to remain objective. Without a commitment to act on the results, the evaluation will not be of value. The form and
extent of the evaluation must take into account the various program stakeholders such as participants, instructors, designers, sponsors and management (Basarab & Root; Broad, 1994; Carnevale & Schulz, 1990a; Easterby-Smith & Mackness, 1992). Basarab and Root distinguish between requesting organizations and funding organizations as management stakeholders.

In order to properly evaluate training programs, base evaluation questions on good front-end needs assessments and program objectives. Establish criteria to measure program success before implementing the program. It is important to know what to evaluate, how the results will be used and who needs to have access to the data (Essentials, 1993). Zammit (1987) adds that, when testing time is at a premium, well-defined terminal objectives will assist in developing an effective course evaluation. It also follows, then, that each program will have unique evaluations.

Developing performance measures, especially as part of well-defined course objectives, is critical to the evaluation of learning transfer. Performance can be physical, cognitive or attitudinal. When conducting the evaluation, be sure to audit for whether the conditions were available for the performance to occur. Also determine how close the training was to when the performance was required in the workplace (Hale, 1994).

Conducting training evaluation is no easy task. Several issues need to be addressed when designing an evaluation. The first is to determine whether the training is work or a perk. If a training class is a perk for previous good performance, then a reaction sheet may suffice. Some training programs are used to produce cultural or symbolic results relating to the organization. In these cases, the technical or substantive content should receive a diminished emphasis. Training that imparts background or historical information may not produce measurable results in the workplace. This is especially true when the participant has the option of using or discarding
the information. Here, again, assessment may be more directed toward reaction and internalized dimensions than toward external, performance-based systems (McEvoy & Buller, 1991).

McEvoy and Buller (1991) continue that, when designed for a change in job performance, training may address skills or behaviors. They make a distinction between skills and behaviors. Skills are activities that are associated with performing job tasks while behaviors deal with the way an individual reacts and interacts with the other individuals and the job environment. Training assessments are generally easier to perform when dealing with skills. When using ratings, they note that there is less variability and more favorability in self-ratings. There also seems to be less agreement between self-ratings and other rating sources. The authors recommend using combined ratings from self, peers, supervisors and subordinates to eliminate the limitations of single-source ratings.

**Evaluation Design**

The client’s needs define the context of an evaluation and how the findings will be used. Clearly state learning and performance objectives and outcomes. The evaluation must take into account the various program stakeholders. Use existing data collection tools and data wherever possible. Development of new instruments and techniques can be time-consuming and organizationally sensitive. The collection techniques must provide timely data to decision-makers. Where part of the assessment involves line managers, they may need training sessions to understand their roles and the evaluation criteria (Carnevale & Schulz, 1990a).

In order for an evaluation to be useful, it must have a clear focus, be logically sound and have the concurrence of the primary audiences it is designed to serve. It is important to identify the objectives and the training. At the classroom level, questions may address trainee reactions, perceived importance of learning objectives, the
appropriateness and quality of materials and facilities, trainer skills and preparation and the trainee learning level. Evaluation questions related to the classroom should define whether specific objectives were addressed, whether learning on these objectives took place, and to what extent the learning took place. One step beyond the classroom addresses who is using the training and to what extent (Brinkerhoff, 1987).

In order to assess the entire course, address all content areas. Keep in mind that the longer the instrument, the less likely the participants are to complete all areas. Length also affects cost to develop and administer (Quinn & Karp, 1991).

According to Ban and Faerman (1990), the ideal design would consist of:

1. Pre- and posttest measurements. Several posttest points are necessary to determine rate of retention.

2. Feedback from multiple sources. There are some concerns about the validity of self-reported changes.

3. A control group. This isolates changes in the workplace that are not training related.

Hale (1994) says that there are some basic elements that should be incorporated into an evaluation design. First, determine what evidence to collect. Then determine when to collect it and how to collect it. Decide what will be done with it after it is collected and finally, who will the results be given to.

According to Basarab and Root (1992), the following elements should be incorporated into an evaluation design:

1. The purpose.

2. The questions that need to be addressed.

3. The data collection procedures to be used.

4. The data analysis procedures to be used.
5. The method to access and control bias.
6. The timeline.

According to Brinkerhoff (1987), there are five critical areas to consider when designing an evaluation process. What is the focus of the evaluation? Focus includes the purpose, audience, training stage(s) and instructional objectives. What questions should be asked? What data will be collected and how will it be analyzed? Who will receive the results and how will the report be formatted? Who will manage the evaluation and what organization resources, including costs, will be needed?

Brinkerhoff (1987) notes that it is important to determine what the indicators of a performance objective are and how they will be measured and collected. Once the indicators are identified, key considerations in data collection are (a) the instruments and forms needed, (b) the sampling of objects or respondents needed, (c) when the data will be collected, (d) how the instruments will be administered and returned, (e) how the analysis will be performed, and (f) how the data will be retained and safeguarded.

An evaluation design, according to Basarab and Root (1992), includes the techniques, procedures, data collection instruments and data analysis models that will be used to carry out the evaluation. Data analysis models must be appropriate to the data collected and vice versa. Data analysis models can range from paper and pencil tabulation through simple PC spreadsheets and databases to sophisticated computer tools. Data analysis provides meaning to the data collected.

Brinkerhoff, (1987) describes important design considerations:

1. Reactivity. Will the way in which questions are asked influence the responses?
2. Bias. Are particular groups of respondents over-represented?
3. Reliability. Are the responses always solicited under the same conditions both in terms of physical conditions and personnel administering?
4. Validity. Do the questions address the evaluation objectives or do they introduce additional parameters?

5. Interruption potential. The least obtrusive procedures are the least likely to be sabotaged.

6. Pilot testing. Debug the instrument and procedure before large-scale administration.

7. Administrator training. Make sure that the administrators of the instrument are thoroughly trained in the process.

8. Availability. Use available data wherever possible.

9. Protocol. Do not violate organizational protocols when collecting data; get the appropriate buy-ins, clearances and permissions.

Bushnell (1991) describes IBM's input-process-output (IPO) model to systematize evaluation. IBM follows four steps in the evaluation process: (a) identify evaluation goals, (b) develop an evaluation design and strategy, (c) select and construct measurement tools, and (d) analyze the data.

Goals identification determines the structure of the evaluation and the associated measurement criteria. Here is where it is determined whether the evaluation is objective or subjective, reaction or performance, quantitative or qualitative. The design and strategy step matches the evaluation and data collection method with the goals. In the third step, construct the measurement tools, making sure to include face, content and construct validity. The tool must match the level of evaluation selected. Some typical tools include questionnaires, performance evaluations, tests, observation, simulations, structured interviews and records (Bushnell, 1991).

Include the following considerations in the analysis phase: (a) collect only pertinent data, (b) collect enough data to address the key elements of the evaluation, (c) insure that the act of measurement is not disruptive to the training, and (d) use analytical
procedures that are appropriate to the goals of the evaluation. Remember that the employee's performance on the job demonstrates the value of training (Bushnell, 1991).

Be sure to evaluate training data only. Do not use the evaluation to evaluate personnel or infer assignment of grades. The data collection and analysis procedures must be designed to address the evaluation questions and the needs and concerns of the stakeholders affected by the results. Part of the process is to determine what are successful evaluation results. Look for standard instruments that can be applied. Determine if the evaluation should be validated (Basarab & Root, 1992).

When designing an evaluation, be sure that the data can be used. Do not go on a fishing expedition. Make sure that it is feasible to collect the data, that it is accurate and that it does not violate any individual rights to privacy. If data is collected from indirect sources, be sure to use more than one source to validate the responses (Hale, 1994).

Carnevale and Schulz (1990a) list the following characteristics of a rigorous evaluation design: (a) data is collected from as many participants as possible, (b) data is collected more than once, (c) evaluation tends toward the organizational results level, and (d) data is quantitative. Rigorous designs are more costly and time consuming, usually yielding formal reports used for determining whether to continue the program. Use them for programs that are critical to regulatory or strategic business concerns.

Carnevale and Schulz (1990a) then list the characteristics of practical, less rigorous designs: (a) data is collected from a small sample of participants, (b) evaluation is directed toward the reaction or learning levels, and (c) data is qualitative. These designs are less costly and time-consuming than rigorous designs. Use them more for program improvement and where programs are not critical to the success of the organization. Reporting is informal.
Rigorous evaluations are usually designed around one or a combination of pre-posttest and control group designs. The pre-posttest design establishes a participant baseline prior to the training intervention. After-training testing can then be compared to the before-training baseline. One weakness of this method is the tendency for extreme scores to move toward the middle in subsequent testing. Thus, an extremely low pretest score for an individual would improve with a second test, even when no intervention occurred. Evaluators need to exercise caution not to interpret this phenomenon as a successful training intervention (Carnevale & Schulz, 1990a).

Control groups are individuals with the same characteristics as the training group except that they do not receive the training. Use them to eliminate the influence of external factors from the baseline (Carnevale & Schulz, 1990a).

The following evaluation designs rank, in the order of presentation, from strongest to weakest in experimental rigor:

1. In the **pre-posttest control group design**, both the training and control groups receive pre- and posttests. The difference in the change between the two groups is attributed to training. It requires that both groups be equivalent. It is sometimes difficult to pull equivalents from a work environment, let alone justify withholding training from them.

2. The **multiple baseline design** takes advantage of training different groups at different times. Pre- and posttest data is collected, with each subsequent group's pretest serving as the control for the previous group. This serves well if the training does not have to be altered for any of the groups and if the training can be effectively broken down into groups over a period of time.

3. The **time series design** repeats data collection from the beginning of training intervention until some time after its completion. It is more practical and less costly than the two previous methods but is also subject to more influence from external
factors. The use of multiple performance measures and the relation of behavior change relative to the timing of the training intervention can provide support for the results.

4. In the single group pre-posttest design, there is no control group. It is inexpensive but lacks enough rigor to statistically support that change was due to training.

5. In a one-time case study, only a posttest is given, usually at or near program completion. This is the most convenient but least rigorous of all evaluation designs (Carnevale & Schulz, 1990a).

Quantitative data usually consists of performance records, questionnaires, surveys and personnel assessments. This data is relatively easy to measure and assign values to. It is objective, with a common basis of measurement. It is normally used where the design needs rigor and standardization to address program continuation, organizational impact or when the program is critical to organizational needs. This type of data is more credible to management than qualitative data (Carnevale & Schulz, 1990a).

Qualitative data consists of interviews, observations, focus groups and case studies. It is difficult to standardize, subjective in nature and behaviorally oriented. It is usually used to supplement quantitative data and for program improvement and adaptation. It may also be used where quantitative data is not available or cannot be made available because of legal or contractual restraints (Carnevale & Schulz, 1990a).

Analytical techniques can include frequency distributions, percent distributions, cross-tabulations comparing responses to two or more questions and hypothesis testing to determine the statistical significance of the change (Quinn & Karp, 1991). The objectives of the client and data collection restrictions will determine which method or combination of qualitative and quantitative data will be collected. The use of multiple methods and data sources, called triangulation, can improve the credibility of the results (Carnevale & Schulz, 1990a).
Improving The Evaluation.

In designing an evaluation, it is necessary to take into consideration the various organizational stakeholders. Data should be gathered from more than one source in order to represent different perceptions. Rapid feedback is important to maintain a sense of relevancy and commitment. Do not use cumbersome and complex evaluation procedures. Use naturally existing evaluation mechanisms wherever possible (Easterby-Smith & Mackness, 1992).

Ingols (1987) notes that evaluation techniques must be consistent with what is taught. Program objectives must be realistic within the time frame and resources. Evaluate against realistic objectives.

Evaluations need greater precision in quantifying attitude and skill acquisition so that the programs can be better fit to participants' requirements. Measuring how well training programs are meeting participants' needs is at the heart of the evaluation process (Fast, 1975). As workplace changes related to training become more subtle, the measures of change have to become increasingly sensitive to these changes in order to detect them (Ban & Faerman, 1990).

Fast (1975) reports on an evaluation technique that augmented the typical written course evaluation with an evaluation of objectives met. Essentially, a chart of course objectives was given to each participant at the beginning of the course. Participants were to weight those objectives of importance to them. At the close of the course, they were asked to rate how well the course met the objectives they had chosen. The weight times the rate gave the overall score. These scores could then be quantified to determine overall the strengths and weaknesses of course areas as well as relative importance. These ratings could be compared to the written evaluations and contained enough detail to assist in tuning course presentation and content at a more detailed
level. It is interesting to note that Fast's approach blends content-specific with environmental reaction responses.

Hawthorne (1987) tells us that corporate education commonly fails to convert classroom training to workplace application. Learning and application are not synonymous. Evaluations will improve when:

1. The firm constructively integrates educational experiences with performance appraisals.
2. The firm demonstrates that the evaluations are constructively used to modify and improve learning programs on an on-going basis.
3. The firm works actively with the trainee to integrate learning into the workplace.
4. All levels of management actively participate in the training program.

Notes On The Use Of Pre- And Posttests.

Quinn and Karp (1991) give some guidance when using pre- and post-training questionnaires to measure the amount of change in knowledge, skills and attitudes resulting from a training program. Have the pre-training questionnaires returned at least two weeks prior to the program to allow for identifying any necessary program changes. Allow at least two months to elapse after the course before administering the post-training questionnaire. This allows enough time for course objectives to be implemented in the workplace. Base the questionnaires on training objectives and performance deficiencies. Maintain participant identification in order to match pre- and post assessments. Otherwise, drop-outs could adversely affect the change measurement. Make the two instruments as similar as possible to avoid introducing bias. Maintain confidentiality of responses. When using a pilot group, be sure that it is a statistically representative sample of the planned training population. If possible, administer the pre- and posttests to a statistically sampled control group that is also
representative of the population to be trained. This allows removal of the change influenced by external factors.

Reeves and Jensen (1975) report on a study made of adult education programs offered by three ASTD institutes in 1968 and 1969. They noted general consistency of course evaluations between both participants and staff. Of note was that participant opinion of the course declined while opinion variability increased as post-course evaluation was moved further from course completion. Hawthorne (1987) cites Hogarth, 1979, that evaluations made retrospectively were harsher than those made immediately at the end of a course. This may be attributable to a reduced halo effect and effort necessary to integrate course material into the work place.

Follow-up evaluation at some time after course completion may yield conflicting results when actions on the job are not the same as the learned responses (Ingols, 1987). One must be careful in designing a pretest/posttest study that confounding variables were not introduced during the time between tests (Hawthorne, 1987). According to Ban and Faerman (1990) posttest evaluations where significant time has elapsed since training may yield ambiguous results for the following reasons:

1. Training design and delivery. Course designers must deliver a course that is generally a compromise between specific and generic job needs.

2. Trainee background. What prior experience and learning ability comes with the trainees to the classroom?

3. Trainee motivation. What incentives do the individual trainees have for attending the course?

4. Workplace environment. What workplace and organizational factors exist that hinder the transfer of SKA's to the job?

Kirkpatrick (1975d) says that the literature dealing with results-oriented design and application by 1975 is sparse due to the complexity of designing the evaluation.
Most before and after studies do not attempt to separate external factors when linking training to results. Easterby-Smith and Mackness (1992) relate that follow-up interviews they performed, though providing valuable information, were very time consuming. Only an 8 per cent sample could be taken. Ban and Faerman (1990) found the logistics of follow-up evaluations were difficult. Trainees changed jobs, supervisors resented the demand on their time, especially if they were not convinced of its usefulness. Brinkerhoff (1987) advises caution when using pre- and posttests. The pretest may not properly indicate the trainee's knowledge, or lack thereof, relative to the program material to be presented.

The business place seldom uses sophisticated measures and statistical analysis. Two reasons suggested are lack of expertise in using the techniques and concern about criticism among evaluators. To address the first concern, evaluators are using multiple sources for feedback, both quantitative and qualitative. For the second, some organizations use either outside evaluators or a separate department for evaluation. The function of the evaluations is consultative rather than critical (Carnevale & Schulz, 1990b).

**Added Dimensions**

In addition to evaluating how well training meets organizational needs and objectives, there are two other training dimensions that need to be incorporated into a workplace training evaluation. These are teacher effectiveness and adherence to the principles of adult education.

**Teacher Effectiveness.**

It is estimated that nearly 700,000 full and part time educators are in business and industry (Young, 1979). In spite of this large network and expenditure, most trainers are chosen for their subject mastery. Few have any training or foundation in the principles and techniques of teaching (Clement, 1985; Melvin & Carrier, 1986; Young).
Young reported common uses and abuses of training techniques in a group of typical industrial trainers who were not trained educators. Training objectives were not clearly defined, communicated or directed to student need. Most material sequencing was in logical order. General to specific or why before how followed in frequency. Sequencing by interest, skill or frequency did not occur.

Young (1979) continues that lecture was the primary means of instruction. Repetition of main points was lacking. Material covered within a given time frame was poor. This was influenced by time away from the job available for students as well as a lack of clear training objectives. Problem solving, role playing, case studies, demonstrations and quizzes were seldom used. Too much emphasis was on passive, rather than active participation.

Young (1979) goes on that trainers depended on overhead projectors and transparencies as visual aids. Frequently, trainers did not have the transparencies in order and blocked the projection while changing them. Distracting mannerisms and behavior included pacing, jingling of coins in pockets and incessant tapping on furniture. Continuous eye contact was also lacking.

Clement (1985) discusses some additional problems that compromise training effectiveness. First, too many instructors rush to complete the material within the prescribed time. They are not aware of whether or not learning is going on in the classroom. Second, untrained instructional designers and inadequate needs analyses burden courses with more material than the student needs to know to meet job performance standards. Finally, training administrators overemphasize costs and logistics. This results in little time to spend on instructor evaluation and training effectiveness follow-up. Broadwell (1990) points out that even good instructors cannot overcome bad course design. More emphasis should be placed on correcting design rather than compensating for it.
Schneier (1974) notes that the successful design and implementation of a training program depends on the ability to diagnose the learning situation represented by the interplay of these factors. The successful choice of the training program and strategies for facilitating learning is based upon this diagnosis. Once the diagnosis is complete, actual program and strategy design can begin. When the design is complete, then the program can be implemented. The final phase of the approach is evaluation and redesign. Familiarity with the elements of the learning categories can assist in conducting each of the phases of the facilitation process.

Clement (1985) suggests the following strategy to maximize learning. First, new information should be logically integrated, or clustered, to expedite retention. Second, the number of new items should range from three to no more than seven, depending on complexity. Drills, practice, workshops and homework should follow each cluster of items to permit absorption and aid recall. Finally, reviews of the cluster material should occur before new material is presented. This will reinforce learning while filling in any knowledge gaps.

George (1987) reports that the results of research on effective public school teaching can serve as the basis for effective corporate training strategies. The training setting requires careful planning and review, effective use of classroom time and a warm but businesslike structure. The goals of the organization and the needs of each class of learners are constantly monitored to maximize the learning process within the allotted time. A mind set is established at the beginning of each class that supports the desired level of learning. It includes establishing a rapport with the students, beginning on time, teacher responsibility for learning, material reviews and overviews and colorful, neat classroom displays.

Learning momentum is sustained by the teacher's authentic enthusiasm for the material and the students. It includes concrete, physical learning models rather than
abstractions and active teacher control throughout the learning process, especially
during periods of student independent work. Effective teachers make good use of
guided practice in the classroom. This includes question and answer sessions and
group recitations that include all members of the class. Questions should be simple,
straightforward and generate a high percentage of student success. Independent
practices must be highly structured and carefully monitored (George, 1987).

Instructors must assess the student base and tailor teaching options to meet
individual, not average needs. More mature student groups will require less common
material, playing a more active role in designing their learning experience (George,
1987).

Zemke (1978) discusses behavior modeling, learning by observation and imitation,
as a key concept in workplace education. The first step in learning by modeling is
observation to acquire a mental picture of the act to be learned. The second step,
imitation, is the performance of the observed act. This learning approach has been
particularly effective for learning complex motor skills and interpersonal
communications skills. The latter includes selling, supervisory, customer and employee
relations skills. Under the proper conditions, exposure to role models is a quick and
effective means of learning desired behavior. This is the basis of social-learning theory.

Zemke (1978) lists three processes necessary to successful modeling-based
training: a) attention to pertinent behaviors, b) retention of the information, c) practice
and positive reinforcement. He passes along some tips and tricks used by Dr. W. C.
Byham whose company specializes in developing training programs based on behavior
modeling. First, do a good needs analysis so the wrong problem is not solved. Then
determine situations that will use the new behavior. Define the critical steps to master
the behavior; do not over complicate the training. Work on one skill at a time. Allow
for time to use and reinforce the skill before introducing another. Spend half the
training time addressing job problems that are real to the trainees. Keep feedback
positive. Encourage the training group to provide mutual support.

**Principles Of Adult Education.**

Borrowing from the Europeans, Knowles first introduced the concept of andragogy in the US. As pedagogy addresses teacher-centered education, primarily for children, andragogy addresses the art and science of helping adults learn. The concept incorporates the individual adult's need for self-directed learning, drawing on the learner's experience. Several assumptions underpin the andragogical model. The first is that students desire to feel responsible for directing their own learning. The second is that adult learners bring a wide range of experience into the learning situation. Group discussion, simulations, labs, field experiences and problem solving take advantage of these experiences. Third, the orientation to learn for adults centers around a life, task or problem situation. Courses need to show how they will help adults successfully resolve their situation. Finally, adults are more internally than externally motivated. Motivation includes such factors as self-esteem, confidence, recognition and quality of life (Knowles, 1984).

Knowles' (1984) andragogical model is process-oriented. The teacher becomes a learning facilitator first and a content resource only secondarily. The teacher assumes the role of process manager, with the student taking a more active role in acquiring knowledge and skills. For Margolis (1984), the andragogical approach is learning by doing, learning by discovery, hands-on learning. This approach consists of a series of planned, structured activities emphasizing analysis and decision-making related to the learner's job and work environment.

Jarvis (1983) notes that most writers on adult learning recognize that adults learn most effectively when there is a perceived problem or need. They also recognize the important role that experience and reflection play in the learning process.
Jarvis (1983) delineates the conditions of adult learning. Underlying it all is that learning is a basic human need. Motivation to learn is high when there is a direct problem or need. Adult learners bring their own unique experiences, meaning systems and needs to the learning situation. They also bring their unique self-confidence, self-esteem and self-perception. They bring with them their own learning styles. They learn best when they are not threatened and when treated as responsible adults. Participation enhances learning.

The ability to learn in adults does not diminish significantly with age. Adults learn at different speeds due to educational background, intelligence, attention span, learning abilities and physiological situations due to aging such as vision, hearing and health. Physical limitations, learning and visual acuity, strength, etc. do need to be taken into account when designing the learning experience (Jarvis, 1983).

Kundu (1986) notes that adults may bring considerable and varied experience and expertise to a learning situation. He details what adults usually require from their educational experience. They require SKA's that meet their recognized needs to solve a problem or attain personal goals. These needs are usually immediate and short-term. They need to be actively involved in an efficient learning experience that allows them to control and enjoy a changing environment. It is important to be provided instructors with subject matter expertise and the ability to relate to the learner.

Adults consider themselves as independent and self-directing. Their learning environment should incorporate adult learning factors. They need to be actively involved in planning and directing their learning activities. Adults are generally concerned with resolving a current conflict, need or problem. The learning experience should address these conflicts, needs and problems. The learning environment should take into account the different learning abilities, attention spans, speeds, and physical
differences of the learners. Instructors should assist the learner along the learning path, drawing upon the learning group's experience during their education (Dickinson, 1973).

Dickinson (1973) also emphasizes practice, practical application, feedback and reinforcement in the learning situation. In addition, the learning should take place in a physically pleasant environment that is psychologically positive and encourages change.

Similarly, Kundu (1986) states several concepts of adult education that will assist learning. Learning takes place through practice and application. Feedback is necessary to reinforce learning validity. Follow-up aids reinforcement. Satisfaction with the learning process is necessary if the learner is expected to continue. As demonstrated in the learning curve, learning is a gradual process. Retention drops rapidly after learning. Concepts are remembered longer than facts. Practice, reinforcement and follow-up aid in retention.

Consolidating the basic concepts of adult education from these various sources:

1. Courses need to demonstrate how they will help adults successfully resolve their situation.

2. Learners should have active involvement in planning and directing their learning activities.

3. Group discussion, simulations, labs, problem-solving and field experiences take advantage of learner experiences.

4. Courses should encourage active participation using practical, learner-centered applications.

5. Learning should be placed in a conceptual framework.

6. The learning environment should be non-threatening, accommodate different learning styles, learning speeds and physical limitations.

7. Immediate positive feedback, reinforcement and follow-up are required.
8. Instructors need both subject matter expertise and the ability to relate to the learner.

9. The instructor assists, not directs, the learner along the learning path.

10. Learning should take place in a physically pleasant environment that is psychologically positive and encourages change. Knowles (1984) cautions that when adults address a learning situation where they have little or no experience, then a more controlled, teacher-centered and directed approach is necessary.

Planning a Level 3 Evaluation

Broad (1994) defines the transfer of training as the effective transfer of knowledge and skills to the participants' jobs. Phillips (1991) notes that a change in knowledge, skills or performance of a training participant does not guarantee translation to performance on the job. In other words, a successful end-of-course evaluation does not guarantee successful transfer of training to the workplace. A major component of training transfer is attitude, the willingness of the participant to apply the learnings back on the job. Level 3 evaluation needs to incorporate the dimensions of participant attitude and organizational environment.

Purposes Of Level 3 Evaluation

Basarab and Root (1992), Hale (1994), Sullivan (1994) and Norton and Bennett (1994) delineate the purposes for conducting a Level 3 evaluation:

1. Determine whether training transferred to the workplace.

2. Determine if program objectives are being met: course, job, sponsor, organizational.

3. Identify how well each objective meets job needs.

4. Determine whether the training has fully addressed the problem it was to resolve.
5. Assess the impact of the program on the job.

6. Determine whether the training is appropriate for the audience.

7. Establish an historic basis for comparative purposes.

8. Determine accuracy of program content.

9. Identify areas for training program improvements.

10. Identify any environmental, cultural and organizational barriers to learning transfer.

Basarab and Root (1992) offer guidelines for determining if a Level 3 evaluation should be performed. First, the objectives should be observable and measurable. Conceptual objectives are difficult to measure. Second, a significant sample size should be obtainable. The authors consider 50 as a minimum. Next, Levels 1 and 2 have been performed with positive results. Finally, barriers to learning transfer have been isolated.

**Reducing or Eliminating Bias and Error**

Basarab and Root (1992) specify several methods to reduce or eliminate bias in an evaluation:

1. Use pre-post training evaluation to determine if a change occurred coincident with training.

2. Query multiple sources such as participants, peers, subordinates and supervisors. Use at least two sources.

3. Use data analysis procedures that help isolate those skills that were transferred to the job from those that were not.

4. Allow time to pass between training and evaluation to allow skills to take hold and be reinforced.

5. Use a control group wherever possible for comparative purposes.
Phillips (1991) notes that it is important to establish baseline data to determine whether training is needed and whether training contributed to a job change.

According to Basarab and Root (1992), a timely, systematic method should be used to collect data. Random collection on an ambiguous timeline lends itself to bad data. Organize and retain data to facilitate its use and prevent loss. Determine what a sufficient response rate to the evaluation instrument is. If the rate is too low, then extend the collection period, send out a reminder letter to the respondents or both. If a large number of unusual responses is obtained, it is an indicator of a poor evaluation instrument. It may also indicate that the respondents are outside of the target population. Hale (1994) points out that asking the wrong population or asking wrong or poorly formatted questions are sources of error in evaluations.

**Statistical Techniques**

Statistical techniques for analyzing Level 3 data include statistics and graphical representations. Frequency distributions and histograms are particularly suitable to describe Level 3 data. For closed response questions, use quantitative statistics such as mean, standard deviation, frequency distributions and histograms. For open response questions, use coded transformations and related frequency distributions and histograms. Pie charts are one method of graphically displaying frequencies (Basarab & Root, 1992).

**Sample Size**

Phillips (1991) provides a formula for calculating sample sizes where the population is larger than 30: \( n = \left( \frac{z_{\alpha} \sigma}{d} \right)^2 \), where \( n \) is the sample size, \( z_{\alpha} \) is the \( z \)-score for the confidence level \( \alpha \) and \( d \) is the required precision in absolute terms. He notes that sample size is also a function of the perception of the decision makers' comfort level.
Phillip's (1991) formula is based on one derived in Cochran (1953). Cochran's calculates \( d \) as the product of the mean of the population and the percentage accuracy desired. Since estimates of the sample mean and standard deviation normally have to be made in the absence of population data, the calculation for sample size is more appropriately \( n = \left( \frac{z_{\alpha}s}{d} \right)^2 \). According to Cochran, previous samples are used by the researcher to further refine the estimates for additional sample size calculations during later research, assuming no significant intervening variables have seriously altered the population.

Kirk (1982) discusses the concept of power in a statistical test and how it relates to sample size calculations. His formula for calculating \( n \) is the same as that of Cochran (1953) except for the inclusion of a term to limit the probability of making a type II error (power): \( n = \left( \frac{z_{\alpha} - z_{\beta}}{\sigma/d} \right)^2 \). According to Kirk, the minimum generally acceptable level of power \((1-\beta)\) is 0.80. The use of \( d \) in this formula is the same as with Phillips. It is the minimum absolute distance from the mean that we want to detect a practical significant difference. Note the term \( \sigma/d \) in the formula. The smaller the value of \( d \), the larger the required sample size to detect a significant difference. This term is also the same as that used in Cochran. Kirk refers to Cohen's (1969) definition of the inverse of this term as the effect size. Again referring to Cohen, effect sizes of 0.2, 0.5 and 0.8 are termed small, medium and large effect sizes, respectively. In order to restate this formula to be consistent with using an estimate of the sample standard deviation, we would express it as: \( n = \left( \frac{z_{\alpha} - z_{\beta}}{\sigma/d} \right)^2 \).

In order to balance precision with practicality, Kirk suggests that the researcher calculate preliminary sample sizes using different effect sizes prior to making a final decision. This also aids the researcher in understanding what effect sizes make practical sense to detect.
CHAPTER 3: METHODOLOGY

Population and Sample

The target population of this study were employees from a petrochemical complex in Louisiana who had completed one or more selected introductory Microsoft courses taught on-site by a contract vendor. The accessible population was the subset of the target population who attended at least one of the courses within the last seven full months prior to the instrument being applied, were still employed at the site and were listed in the complex directories.

From a previous study of one of the plant sites in the complex, some 22% of the employee population were high school graduates, some of whom had also attended a trade or business school. Those with some college represented just over 40% of the population. College graduates were nearly 28% and those with post-graduate degrees were almost 10%. The population with only some high school was negligible. Since hiring practices were consistent across the complex, this mix was representative for the total of the locations involved in the study.

For purposes of this study, a course represents multiple sessions over the seven-month study period of one particular course title, such as Introduction to Microsoft Windows. Sessions generally averaged six to seven participants. To avoid non-representative sessions, any session with less than four participants was excluded from the study.

The sampling plan involved random selection of 150 participants in sessions of the three Microsoft courses with the highest attendance who completed the sessions from one to seven full months of this study's initiation. Participants were employees of the petrochemical complex who were listed as employees of Site A, Site B or Site C. A list of 279 qualifying individuals was generated from a training records database. These individuals were sorted alphabetically within course. An increment size was
calculated to select 150 subjects from this list. The researcher flipped a coin and a second person called the coin side to determine the starting record of the two available for selection. The second record was selected and the increment applied to all remaining records in the list. Selected individuals who were no longer employed at the site or who could not be located in the directories were dropped from the study and the next individual in sequence replaced them. Some individuals who attended more than one course were selected more than once under this plan.

The sample size is based on Kirk's (1982) calculation: 
\[ n = \left( \frac{z_{\alpha} - z_{\beta}}{\epsilon} \right)^2 \]
where \( z_{\alpha} = 1.96, \beta = 0.10, z_{\beta} = 1.28, \sigma = 0.83 \) and \( d = 0.33 \). This yielded a minimum sample size of 67. This formula yielded an effect size of 0.40, slightly tighter than a medium effect size. The probability for a type I error was set at 5% and for a type II error it was set at 10%. The \( z \) values were calculated based on a 2-tailed test. If the power term were removed from this calculation, we would have had Cochran's (1953) formula. The sample size calculation using Cochran yielded a minimum sample size of 24. The sample, based on Kirk, was increased to 150 to account for non-respondents.

Instrumentation

The Instrument

The study instrument was designed by the researcher, with the assistance of two validation groups, and included a cover letter followed by four sections. Scaled items on the instrument consisted of a 6-point anchored scale. The scales had a 5-point range from High to Low plus a None anchor point to allow for a no or none response. The first section, titled Customer Information, collected respondent demographics. These demographics were course title, job classification and local reporting organization. The second section titled Course Objectives/Instruction, consisted of a series of questions designed to measure formative data relating to the course terminal objective and selected primary enabling objectives as stated in the published course description. Each
objective was evaluated on the level of the respondent's understanding of the objective, the importance of the objective to the participant's job and the participant's confidence in their ability to perform the objective. An additional question rated the use of examples related to the participant's job, opportunities for discussion and practice and how well the participant was satisfied with the instructional methods. All of these questions used the 6-point anchored scale.

The third section, titled Application to the Job, collected data relevant to the application of the course learnings to the job. This section measured supervisor and peer support, the impact of the course learnings on work output in terms of productivity and quality and the participant's overall satisfaction with how well the course met related job needs. In addition, the participants were asked to identify the types and levels of workplace barriers that inhibited transferring course learnings to the job. The preceding questions used the 6-point anchored scale. The participants were also asked to estimate the percentage of time they had opportunities to apply the course learnings to their jobs as well as the percentage of this opportunity time they actually applied the learnings, both before and after completing the course.

The fourth and final section, titled Customer Recommendations/Course Impact, solicited open-ended responses from the participants. The participants were asked to recommend content additions to the course that would significantly improve their job performance, as well as any changes that would significantly improve the course. They were also asked to identify any significant personal or organizational changes resulting from the course. Finally, they were given the opportunity for general comments.

**Validation**

The initial draft instrument was mailed to a group of individuals identified by the researcher as having relevant job experience in training, instrument design or evaluation. Responses from the panelists were incorporated in the instrument design.
The panelists consisted of the Training Superintendent for a local plant, two Training Supervisors for sister plants in Texas, a Department Training Coordinator from one of complex sites, a Project Director and a Senior Project Director from an educational testing firm and an Assistant Professor in the School of Management for a New York university who consults in the area of market research. Four of these individuals had earned doctorates in their fields.

After incorporating the comments and suggestions of the subject matter experts, a small focus group of five course participants from the complex were used to further refine the instrument. The members of the focus group were selected to represent a cross section of course participants. The questionnaire was administered to the focus group members who then responded with comments and suggestions to the researcher as each item was separately reviewed. Their comments and suggestions were also incorporated into the final instrument.

Data Collection

Anonymity in the work environment was vital to obtaining survey responses. Because of a strong union environment and an aversion to providing personal data that could be related to job performance in the general population, the study instrument could not solicit personal data. Thus, the follow-up plan had to include the entire study population rather than only non-responding individuals. A member of the focus group commented that his organization improved survey response rate to almost 60% by sending the instrument to supervisory personnel for distribution to the study respondents. Based on this recommendation, survey packages were sent to the individuals' supervisors with an appropriate cover letter for the supervisors soliciting their support for encouraging their employees to return the instrument. The individual packages were mailed to each subject, via their supervisors, with instructions to
complete the instrument and return it within two weeks to the researcher via a pre-addressed envelope.

The final response was 85 of the 150 solicited, or 56%. Ten of the responses were eliminated from the study. Five because they had not taken the study courses, two because they were not from the study organizations, one because the supervisor did not wish his employee to participate and two because they provided no qualitative data, only a general comment. The net study respondents were 75, exactly 50% of those solicited. Since this response was greater than the sample size needed, no follow-up was conducted. The demographics obtained from the study were compared against the known demographics to determine whether any significant data misrepresentation may have occurred. These results are reported in Table 1. The response for supervisors was 6% higher than the sample population while the response for professional and wage job classifications were 2% and 4% lower than the sample population, respectively.

The higher supervisor response percentage, offset by lower professional and wage percentages, could have resulted from one or several of the following factors:

1. The response was slightly skewed towards supervisors.
2. Individuals considered their roles to be different than the official designation, especially in their interpretation of supervisory roles or functions.
3. The official designation was not current with the actual. This database was traditionally six weeks behind current.

The demographics for the population sample were taken from an official employee database (Selected). They were compared against the responses given in the instruments (Responded).
Table 1

Comparison of the Demographics Between Participants Who Were Sent the Instrument and Those Who Responded, by Job Class

<table>
<thead>
<tr>
<th>Job class</th>
<th>Selected no.</th>
<th>Selected %</th>
<th>Responded no.</th>
<th>Responded %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manager</td>
<td>1</td>
<td>.8</td>
<td>1</td>
<td>1.3</td>
</tr>
<tr>
<td>Supervisor(a)</td>
<td>31</td>
<td>20.8</td>
<td>20</td>
<td>26.7</td>
</tr>
<tr>
<td>Professional</td>
<td>23</td>
<td>15.4</td>
<td>10</td>
<td>13.3</td>
</tr>
<tr>
<td>Technical</td>
<td>36</td>
<td>24.1</td>
<td>18</td>
<td>24.0</td>
</tr>
<tr>
<td>Staff support</td>
<td>30</td>
<td>20.1</td>
<td>15</td>
<td>20.0</td>
</tr>
<tr>
<td>Wage</td>
<td>28</td>
<td>18.8</td>
<td>11</td>
<td>14.7</td>
</tr>
<tr>
<td>Total</td>
<td>149(b)</td>
<td>100.0</td>
<td>75</td>
<td>100.0</td>
</tr>
</tbody>
</table>

\(a\)Includes temporary and permanent first and second line supervisors. \(b\)Excludes 1 respondent from a site that was not part of this study.

Statistics

Study areas were related to specific study objectives in Table 2, as well as the instrument questions where the objectives were found and the statistics that were calculated. Statistical summaries not included in Table 2 are described in the section that follows the table. Objective 1, respondent demographics, were not included in Table 2.

All statistics for the stated study objectives were compiled at the course level. The components of the instrument by section and a description of transformations and calculations as well as statistical summaries not included in Table 2 follows the table.
Table 2

Relation of Objectives to the Instrument and Study Statistics, by Study Area

<table>
<thead>
<tr>
<th>Area</th>
<th>Objective</th>
<th>Question</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivery</td>
<td>Methods (7)</td>
<td>5D</td>
<td>M, SD</td>
</tr>
<tr>
<td>Involvement</td>
<td>Discussion (6)</td>
<td>5B</td>
<td>M, SD</td>
</tr>
<tr>
<td></td>
<td>Practice (6)</td>
<td>5C</td>
<td>M, SD</td>
</tr>
<tr>
<td>Construction</td>
<td>Understanding (2)</td>
<td>1A, 2A, 3A, 4A</td>
<td>M, SD</td>
</tr>
<tr>
<td></td>
<td>Additions (14)</td>
<td>14</td>
<td>a</td>
</tr>
<tr>
<td></td>
<td>Changes (15)</td>
<td>15</td>
<td>a</td>
</tr>
<tr>
<td>Relevance</td>
<td>Importance (3)</td>
<td>1B, 2B, 3B, 4B</td>
<td>M, SD</td>
</tr>
<tr>
<td></td>
<td>Examples</td>
<td>5A</td>
<td>M, SD</td>
</tr>
<tr>
<td></td>
<td>Satisfaction (13)</td>
<td>13</td>
<td>M, SD</td>
</tr>
<tr>
<td>Confidence</td>
<td>Confidence (4)</td>
<td>1C, 2C, 3C, 4C</td>
<td>M, SD</td>
</tr>
<tr>
<td>Support</td>
<td>Supervisor (8)</td>
<td>6</td>
<td>M, SD</td>
</tr>
<tr>
<td></td>
<td>Peer (8)</td>
<td>7</td>
<td>M, SD</td>
</tr>
<tr>
<td>Barriers</td>
<td>See question 8 for list (9)</td>
<td>8</td>
<td>M, SD</td>
</tr>
<tr>
<td>Application level</td>
<td>Opportunity time (11)</td>
<td>11</td>
<td>M, SD</td>
</tr>
<tr>
<td></td>
<td>Pre-course (12)</td>
<td>11 X 12B</td>
<td>M, SDb</td>
</tr>
<tr>
<td></td>
<td>Post-course (12)</td>
<td>11 X 12A</td>
<td>M, SDb</td>
</tr>
<tr>
<td></td>
<td>Application gain (12)</td>
<td>e</td>
<td>M, SD</td>
</tr>
<tr>
<td>Work product</td>
<td>Productivity (10)</td>
<td>9</td>
<td>M, SD</td>
</tr>
<tr>
<td></td>
<td>Quality (10)</td>
<td>10</td>
<td>M, SD</td>
</tr>
<tr>
<td>Changes</td>
<td>Individual (16)</td>
<td>16</td>
<td>a</td>
</tr>
<tr>
<td></td>
<td>Organization (16)</td>
<td>16</td>
<td>a</td>
</tr>
<tr>
<td>Differences (17)</td>
<td>Independent</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Job class</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reporting organization</td>
<td></td>
<td>Demographics</td>
</tr>
<tr>
<td></td>
<td>Dependent</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Application gain</td>
<td></td>
<td>e</td>
</tr>
</tbody>
</table>

(table cont'd.)
<table>
<thead>
<tr>
<th>Area</th>
<th>Objective</th>
<th>Question</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differences (19)</td>
<td>Instructor by:</td>
<td>Demographics</td>
<td>f</td>
</tr>
<tr>
<td></td>
<td>Mean understanding</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean confidence</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Examples</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discussion</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Instructional methods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relationships (18)</td>
<td>Independent</td>
<td>d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Application gain</td>
<td>e</td>
<td></td>
</tr>
<tr>
<td>Relationships (18)</td>
<td>Independent</td>
<td>d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supervisor support</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Peer support</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Relevance</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Relationships (18)</td>
<td>Independent</td>
<td>d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Application gain</td>
<td>e</td>
<td></td>
</tr>
</tbody>
</table>

aCompile and summarize. bPaired t-test. c2-factor, independent measures ANOVA. Include main and interaction effects. dKendall's tau-b. e11 times (12A-12B). fANOVA. ( ) Objective Number.

Customer Information Section

This section described the respondent demographics for course attended, instructor, job classification and local reporting organization (Objective 1). The number of responses and percentage of the total were compiled for each item.

Course Objectives/Instruction Section

Questions 1 through 4 determined how well the major enabling and terminal course objectives were understood by the respondents (Objective 2), how important they were to job performance (Objective 3) and how confident the respondents' were in their ability to apply the objectives to their jobs (Objective 4). In addition to the statistics listed in Table 2 for each course objective, the mean and standard deviation
were calculated for the combined elements of the terminal and each enabling objective. Question 5 determined, for the overall course, the relative use of course examples relating to the respondents' job (Objective 5), the extent that respondent involvement through discussion and practice was incorporated in the course design (Objective 6) and how satisfied the respondents were with course instructional methods (Objective 7).

Application To The Job Section

Questions 6 and 7 described the level of supervisor and peer support for applying the course content to the job (Objective 8). These questions solicited either Supportive or Unsupportive responses but not both. These responses were combined into one 11-point scale before calculating the mean and standard deviation. The mean and standard deviation for both questions, combined, were calculated for overall organizational support.

Question 8 identified the presence and extent of physical respondent and workplace barriers hindering the transfer of learning to the job (Objective 9). This question included an open-ended response to identify additional barriers that were not explicitly listed. These responses were compiled and reviewed to determine if any were significant and if any should be added to the explicit list for future surveys. For the purpose of this analysis, they were grouped under Other.

Questions 9 and 10 estimated the impact of course content on the respondents' work product in terms of productivity and quality (Objective 10). These questions solicited either Increased or Decreased responses but not both. These responses were combined into one 11-point scale before calculating the mean and standard deviation. The mean and standard deviation for both questions, combined, was calculated for overall work product impact.
Question 11 estimated the percentage of time the participant had the opportunity to apply the course content (Objective 11). See Table 2 for statistics. Question 12 estimated the percentage of opportunity time the respondent applied the course content before and after attending the course (Objective 12). The product of pre- and post percentages with opportunity time (from Question 11) was calculated. The difference between these products was calculated as Application Gain. See Table 2 for statistics. An ANOVA was performed to determine if the pre- and post application times were significantly different within a 0.05 level of significance. Question 13 determined the respondents' satisfaction with how well the overall course met their related job needs (Objective 13). See Table 2 for statistics.

Customer Recommendations/Course Impact Section

Questions 14 through 16 determined if there were any content areas that should have been included in the course but were not (Objective 14), identified suggested improvements to the course (Objective 15) and identified significant respondent or organizational changes resulting from applying the course content (Objective 16). Since these were open-ended responses, the data was compiled and summarized only. An open-ended response was included at the end of the instrument for general participant comments. These responses were compiled and summarized.

Overall

Objective 17 determined if there were any significant differences in application gain between Job Classification and Reporting Organization. A 2-factor, independent measures ANOVA was calculated to determine if there were significant differences, within a 0.05 level of significance, between levels of the factors Job Classification and Reporting Organization based on application gain. If any significant main or interaction effects were indicated, the survey data would have been reviewed for indications of causality.
Objective 18 determined the strength of the relationship between the independent variable application gain and the dependent work product variables of productivity and quality. Since the dependent variables were measured on an ordinal scale, Kendall's Tau was used to calculate the correlation coefficient.

Objective 18 also determined the strength of the relationship between the independent variables of peer support, supervisor support and satisfaction and application gain. Since the independent variables were measured on an ordinal scale, Kendall's Tau was used to calculate the correlation coefficient.

Objective 19 determined if there was a statistically significant difference between instructors for the understanding and confidence components of the course objectives, the use of work-related examples, practice and discussion and the overall respondent satisfaction with the instructional methods. An ANOVA was performed separately on each element to determine if there were any significant instructor differences within a course. The elements of understanding and confidence were separately combined across all objectives prior to conducting the ANOVA.

The statistics calculated in this study indicated areas of strength and weakness in factors identified as influencing learning transfer. The statistics for each study objective were evaluated and suggestions made for follow-up in the course design or workplace. Data from the open-ended questions was used to evaluate the number and significance of physical barriers to transfer, suggestions for course modification and improvement and areas where the course significantly impacted the individual or the organization.
CHAPTER 4: FINDINGS

Objective 1 was to describe the respondent demographics by course attended, instructor, job classification and local reporting organization. The instrument that each respondent received was pre-coded for course attended and instructor. Respondents were asked to select their job classification and reporting organization from a list provided for each in the Customer Information section of the instrument.

Job classification demographics by course are reported in Table 3. All of the 75 respondents provided this information. First line supervisors made up the highest total response, at just over 25%. They were followed by technical personnel at 24% and staff support at 20%. Second line supervisors and managers had only one response each.

By course, Windows had the highest representation at almost 47%. Word had the least at slightly more than 21%. First line supervisors were most represented in Windows and Excel. Technical personnel were most represented in Word and Excel. Staff support were most represented in Windows. The highest representation for wage was in Windows. They had no representation in Word. Professionals were most represented in Windows.

Reporting Organization demographics by course are reported in Table 4. Of the 75 total respondents to the instrument, 73 indicated their reporting organization. Slightly more than 75% indicated that they reported to Organization B. Just over 20% reported to Organization A. Only two reported to Organization C. The highest response for Organization A and B was in Windows and the lowest for both was in Word. It should be noted that Organization B was undergoing a conversion of their personnel to the Windows environment during the period of this study.

Instructor demographics by course are reported in Table 5. Of the 75 total respondents to the instrument, 74 returned their instruments with the cover sheet
Table 3

Number of Respondents by Job Classification Within Course

<table>
<thead>
<tr>
<th>Job Classification</th>
<th>Windows n</th>
<th>Windows %</th>
<th>Word n</th>
<th>Word %</th>
<th>Excel n</th>
<th>Excel %</th>
<th>Total n</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>First line supervisor</td>
<td>9</td>
<td>12.0</td>
<td>1</td>
<td>1.3</td>
<td>9</td>
<td>12.0</td>
<td>19</td>
<td>25.3</td>
</tr>
<tr>
<td>Technical</td>
<td>4</td>
<td>5.3</td>
<td>7</td>
<td>9.3</td>
<td>7</td>
<td>9.3</td>
<td>18</td>
<td>24.0</td>
</tr>
<tr>
<td>Staff support</td>
<td>9</td>
<td>12.0</td>
<td>5</td>
<td>6.7</td>
<td>1</td>
<td>1.3</td>
<td>15</td>
<td>20.0</td>
</tr>
<tr>
<td>Wage</td>
<td>7</td>
<td>9.3</td>
<td></td>
<td></td>
<td>4</td>
<td>5.3</td>
<td>11</td>
<td>14.7</td>
</tr>
<tr>
<td>Professional</td>
<td>5</td>
<td>6.7</td>
<td>2</td>
<td>2.7</td>
<td>3</td>
<td>4.0</td>
<td>10</td>
<td>13.3</td>
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<tr>
<td>Second line supervisor</td>
<td>1</td>
<td>1.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1.3</td>
</tr>
<tr>
<td>Manager</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1.3</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1.3</td>
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<tr>
<td>Total</td>
<td>35</td>
<td>46.7</td>
<td>16</td>
<td>21.3</td>
<td>24</td>
<td>32.0</td>
<td>75</td>
<td>100.0</td>
</tr>
</tbody>
</table>

pre-coded for instructor. One returned the instrument without the cover sheet. Of the nine instructors that taught the respondents, one taught over 30% of the respondents. Another taught just over 16% and two more taught just under 11%. The remaining 43% were taught by the remaining five instructors. Three instructors taught respondents in all three courses. Two of these also taught the most respondents. The remaining six instructors each taught respondents in two of the three courses.

Objective 2 was to determine how well the major enabling and terminal objectives were understood by the respondents. In the instrument location labeled Course Objectives/Instruction, respondents were asked to circle the most appropriate response.
Table 4

Number of Respondents by Reporting Organization Within Course

<table>
<thead>
<tr>
<th>Reporting Organization</th>
<th>Windows</th>
<th>Word</th>
<th>Excel</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n  %</td>
<td>n  %</td>
<td>n  %</td>
<td>n  %</td>
</tr>
<tr>
<td>Organization B</td>
<td>26  35.6</td>
<td>13  17.8</td>
<td>17  23.3</td>
<td>56  76.7</td>
</tr>
<tr>
<td>Organization A</td>
<td>8   11.0</td>
<td>2   2.7</td>
<td>5   6.8</td>
<td>15  20.5</td>
</tr>
<tr>
<td>Organization C</td>
<td>1   1.4</td>
<td>-   -</td>
<td>1   1.4</td>
<td>2   2.7</td>
</tr>
<tr>
<td>Total</td>
<td>35  47.9</td>
<td>15  20.5</td>
<td>23  31.5</td>
<td>73  100.0</td>
</tr>
</tbody>
</table>

a2 missing responses.

on a scale numbered from 0 through 5 in increments of 1. Labels of None, Low, Medium and High were associated with the numbers 0, 1, 3 and 5 respectively. The word Low was stretched so that it began just below the number 2 and ended above the number 1. The word Medium was stretched so that it began just below the number 4 and ended just before the number 2. The word High was stretched to start just above the number 5 and end just before the number 4. This placed the number 4 as the border between Medium and High while the number 2 was the border between Medium and Low. This visually established the number 4 as Medium-High and the number 2 as Medium-Low. The following ranges were then used to interpret the mean scores: 0 - .5 None, >0.5 - 1.5 Low, >1.5 - 2.5 Medium-Low, >2.5 - 3.5 Medium, >3.5 - 4.5 Medium-High, >4.5 - 5 High. This convention was applied to interpret all the
Table 5

Number of Respondents by Instructor Within Course

<table>
<thead>
<tr>
<th>Instructor</th>
<th>Windows</th>
<th></th>
<th>Word</th>
<th></th>
<th>Excel</th>
<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
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<tr>
<td>6</td>
<td>11</td>
<td>14.9</td>
<td>3</td>
<td>4.1</td>
<td>9</td>
<td>12.2</td>
<td>23</td>
<td>31.1</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>13.5</td>
<td>1</td>
<td>1.4</td>
<td>1</td>
<td>1.4</td>
<td>12</td>
<td>16.2</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>2.7</td>
<td>6</td>
<td>8.1</td>
<td>-</td>
<td>-</td>
<td>8</td>
<td>10.8</td>
</tr>
<tr>
<td>9</td>
<td>7</td>
<td>9.5</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1.4</td>
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<td>10.8</td>
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<td>2</td>
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<td>2.7</td>
<td>-</td>
<td>-</td>
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<td>8.1</td>
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<td>2.7</td>
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<td>1.4</td>
<td>2.7</td>
<td>2.7</td>
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<td>6.8</td>
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<tr>
<td>8</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1.4</td>
<td>4</td>
<td>5.4</td>
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<td>2</td>
<td>2.7</td>
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<td>5.4</td>
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<tr>
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<td>1.4</td>
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<td>2.7</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>4.1</td>
</tr>
<tr>
<td>Total</td>
<td>35</td>
<td>47.3</td>
<td>16</td>
<td>21.6</td>
<td>23</td>
<td>31.1</td>
<td>74a</td>
<td>100.0</td>
</tr>
</tbody>
</table>

a1 missing cover sheet with pre-coded response.

instrument scales. The total number of respondents by learning objective within course are included in Table 6, as are the means and standard deviations.

For Windows, the understanding component of two of the learning objectives fell in the Medium range and two fell in the Medium-High range. Overall, the combined mean fell in the Medium range. For Word, three out of the four objectives for Word fell in the Medium-High range while one was Medium. Its combined mean was
Table 6

Mean Levels of Understanding, Importance and Confidence by Objective Within Course

<table>
<thead>
<tr>
<th>Item</th>
<th>Windows</th>
<th></th>
<th></th>
<th>Word</th>
<th></th>
<th></th>
<th>Excel</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n  M   SD</td>
<td>n  M   SD</td>
<td>n  M   SD</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enabling Objective 1</td>
<td>34  2.97 1.14</td>
<td>16  3.69 .87</td>
<td>24  3.67 .87</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enabling Objective 2</td>
<td>33  2.82 .98</td>
<td>16  3.63 1.31</td>
<td>24  3.63 1.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enabling Objective 3</td>
<td>33  4.03 .88</td>
<td>16  4.00 1.37</td>
<td>24  3.58 1.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal Objective</td>
<td>32  3.56 .95</td>
<td>15  3.20 .86</td>
<td>24  3.67 1.01</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Combined</td>
<td>3.32 .82</td>
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<td></td>
<td>3.60 .85</td>
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<td></td>
<td>3.69 .82</td>
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<td></td>
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<tr>
<td>Enabling Objective 1</td>
<td>34  3.44 1.21</td>
<td>16  4.06 .93</td>
<td>24  3.67 1.01</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Enabling Objective 2</td>
<td>33  3.15 1.12</td>
<td>16  4.06 1.39</td>
<td>24  3.71 .91</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enabling Objective 3</td>
<td>33  3.85 1.00</td>
<td>16  4.31 1.30</td>
<td>24  3.54 1.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal Objective</td>
<td>32  3.56 1.16</td>
<td>15  4.27 .80</td>
<td>24  3.67 .92</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combined</td>
<td>3.54 .99</td>
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<td></td>
<td>4.14 .89</td>
<td></td>
<td></td>
<td>3.65 .88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confidence</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enabling Objective 1</td>
<td>33  2.85 1.28</td>
<td>16  3.81 1.05</td>
<td>24  3.75 .94</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enabling Objective 2</td>
<td>32  2.50 1.24</td>
<td>16  3.69 1.25</td>
<td>24  3.54 1.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enabling Objective 3</td>
<td>33  3.76 1.06</td>
<td>16  4.06 1.39</td>
<td>24  3.71 1.08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Terminal Objective</td>
<td>31  3.32 1.17</td>
<td>15  3.60 1.06</td>
<td>24  3.63 1.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combined</td>
<td>3.13 1.07</td>
<td></td>
<td></td>
<td>3.76 .96</td>
<td></td>
<td></td>
<td>3.66 .95</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The scale ranged from 0 to 5 in increments of 1. Scale labels were 0 = None, 1 = Low, 3 = Medium and 5 = High. Mean scores were interpreted as follows: 0 - .5 None, >0.5 - 1.5 Low, >1.5 - 2.5 Medium-Low, >2.5 - 3.5 Medium, >3.5 - 4.5 Medium-High, >4.5 - 5 High.
Medium-High. Excel contained all four objectives in the Medium-High range, as was its combined mean. The combined mean for Excel was the highest and for Windows, the lowest.

Objective 3 was to determine how important the respondents felt the major enabling and terminal objectives were to their job performance. In the instrument location labeled Course Objectives/Instruction, respondents were asked to circle the most appropriate response on a scale numbered from 0 through 5 in increments of 1. Labels of None, Low, Medium and High were associated with the numbers 0, 1, 3 and 5 respectively. The interpretive scale was the same as that described in Objective 2. The total number of respondents by learning objective within course are included in Table 6, as are the means and standard deviations.

In all instances except two enabling objectives in Windows, the mean responses for the importance component fell in the Medium-High range across all courses. The two exceptions for Windows fell in the Medium range. Word had the highest combined mean (M = 4.14). This was followed by Excel (M = 3.65) and Windows (M = 3.54), both near the Low end of the Medium range.

Objective 4 was to determine how confident the respondents felt in their ability to apply the learning objectives to their jobs. In the instrument location labeled Course Objectives/Instruction, respondents were asked to circle the most appropriate response on a scale numbered from 0 through 5 in increments of 1. Labels of None, Low, Medium and High were associated with the numbers 0, 1, 3 and 5 respectively. The interpretive scale was the same as that described in Objective 2. The total number of respondents by learning objective within course are included in Table 6 as are the means and standard deviations.

The mean response for the confidence component of the learning objectives for Word and Excel were all in the Medium-High range, as were their respective combined
means. Their combined means were very similar for Excel (M = 3.76) and Word (M = 3.66). Windows had one Medium-Low objective, two Medium and one Medium-High. Its combined mean was in the Medium range (M = 3.13), approximately one-half point below the mean for Word.

The understanding and confidence combined means for both Windows and Word were below their course importance combined means. For Windows, the confidence and understanding means were in the Medium range as compared to an importance mean in the Medium-High range. For Word, all means were in the Medium-High range. The three means for Excel were essentially the same, in the Medium-High range.

Objective 5 was to determine the relative use of course examples relating to the respondent's job. In the instrument location labeled Course Objectives/Instruction, respondents were asked to circle the most appropriate response on a scale numbered from 0 through 5 in increments of 1. Labels of None, Low, Medium and High were associated with the numbers 0, 1, 3 and 5 respectively. The interpretive scale was the same as that described in Objective 2. Seventy-one responses were obtained. The results are listed in Table 7. The means for all three courses fell near the midpoint of the Medium range and were essentially the same.

Objective 6 was to determine the extent that respondent involvement through discussion and practice was incorporated in the course design. In the instrument location labeled Course Objectives/Instruction, respondents were asked to circle the most appropriate response on a scale numbered from 0 through 5 in increments of 1. Labels of None, Low, Medium and High were associated with the numbers 0, 1, 3 and 5 respectively. The interpretive scale was the same as that described in Objective 2. Seventy-three responses were obtained for both the discussion and practice components. The results are listed in Table 7. For the discussion component, the means for all three courses fell near the lower end of the Medium-High range and were
Table 7

Mean Levels of Relevant Job Examples, Opportunities for Discussion and Practice and Satisfaction With the Course Instructional Methods, Within Course

<table>
<thead>
<tr>
<th>Item</th>
<th>Windows</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M</td>
<td>SD</td>
<td>n</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Job examples</td>
<td>33</td>
<td>2.97</td>
<td>1.21</td>
<td>15</td>
<td>3.07</td>
<td>.96</td>
</tr>
<tr>
<td>Discussion</td>
<td>33</td>
<td>3.76</td>
<td>1.03</td>
<td>16</td>
<td>3.63</td>
<td>1.20</td>
</tr>
<tr>
<td>Practice</td>
<td>33</td>
<td>3.15</td>
<td>.94</td>
<td>16</td>
<td>3.06</td>
<td>1.12</td>
</tr>
<tr>
<td>Methods</td>
<td>33</td>
<td>3.64</td>
<td>.96</td>
<td>16</td>
<td>3.56</td>
<td>1.03</td>
</tr>
</tbody>
</table>

Note: The scale ranged from 0 to 5 in increments of 1. Scale labels were 0 = None, 1 = Low, 3 = Medium and 5 = High. Mean scores were interpreted as follows: 0 - .5 None, >0.5 - 1.5 Low, >1.5 - 2.5 Medium-Low, >2.5 - 3.5 Medium, >3.5 - 4.5 Medium-High, >4.5 - 5 High.

essentially the same. For the practice component, the means for all three courses fell in the Medium range with Word being the lowest (M = 3.06) and Excel being the highest (M = 3.33).

Objective 7 was to determine how satisfied the respondents were with course instructional methods. In the instrument location labeled Course Objectives/Instruction, respondents were asked to circle the most appropriate response on a scale numbered from 0 through 5 in increments of 1. Labels of None, Low, Medium and High were associated with the numbers 0, 1, 3 and 5 respectively. The interpretive scale was the same as that described in Objective 2. Seventy-three responses were obtained. The results are listed in Table 7. The means for all three
courses fell in the Medium-High range with Word being the lowest (M = 3.56) and Excel being the highest (M = 3.88).

Objective 8 was to describe the level of supervisor and peer support for applying the course content to the job. In the instrument location labeled Application to the Job, respondents were asked to circle the most appropriate response on a scale numbered from 0 through 5 in increments of 1. Labels of Neutral, Low, Medium and High were associated with the numbers 0, 1, 3 and 5 respectively. The label Neutral was used instead of None to avoid possible negative connotation associated with the word none as it related to support. When responding to either the supervisor or peer component, respondents were offered one of two scales to respond to, but not both. These scales were labeled Encouragement to represent an overall positive level of support and Discouragement to represent an overall negative level of support. For the statistical analysis, the two scales were combined at the neutral point and extended from -1 to -5 for discouragement and 1 to 5 for encouragement, yielding one scale with 11 points. In spite of the instructions to the contrary, six participants responded to both scales for either the supervisor, the peer or both dimensions. Whenever this occurred, the conflicting responses were coded to missing for this analysis. The results are listed in Table 8. For interpretive purposes, the scale labels and the corresponding ranges are footnoted in Table 8.

Sixty-nine responses to the supervisor support component were included in Table 8. Mean responses for all three courses fell on the encouragement side of the scale. The mean responses for Windows and Word fell in the Medium range and were essentially the same. That for Excel was 0.7 below the others (M = 2.43) and fell in the Medium-Low range.

Sixty-eight responses to the peer support component were included in Table 8. Mean responses for Windows and Excel fell in the Medium-Low range and that for
Table 8

Mean Levels of Supervisor and Peer Support for Applying Course Content to the Job

<table>
<thead>
<tr>
<th>Support</th>
<th>Windows</th>
<th></th>
<th>Word</th>
<th></th>
<th>Excel</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n  M  SD</td>
<td>n  M  SD</td>
<td>n  M  SD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervisor</td>
<td>32 3.13 1.86</td>
<td>16 3.19 2.07</td>
<td>21 2.43 2.01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peer</td>
<td>32 2.22 2.20</td>
<td>14 2.93 1.77</td>
<td>22 1.64 1.99</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combined</td>
<td></td>
<td>2.71 1.61</td>
<td>3.03 1.57</td>
<td>1.98 1.79</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The scale was an 11-point scale, ranging from -5 to 5 in 1-point increments with a neutral center point at 0. The absolute values of the scale ranges used to interpret mean scores was 0 - .5 neutral, >0.5 - 1.5 Low, >1.5 - 2.5 Medium-Low, >2.5 - 3.5 Medium, >3.5 - 4.5 Medium-High, >4.5 - 5 High. A positive mean indicates the supervisor or peer group provided respondents encouragement to apply course content. A negative mean indicates the respondents were discouraged from applying course content.

With the exception of peer support for Windows, all responses ranged from 0 to 5. All responses for peer support for Windows ranged from 0 to 5 except for 1 response at -4.

Word fell in the Medium range. There was at least a one-half point separation between each score with Excel being the lowest (M = 1.64) and Word the highest (M = 2.93). One response for Windows rated peer support at -4. The respondent believed that this was a result of peer apprehension to having to change software. The means for supervisor and peer support were combined within course as an indication of overall organizational support. Excel was the lowest (M = 1.98) and Word the highest (M = 2.93). The mean for Excel fell in the Medium-Low range while the other two fell in the Medium range.
Objective 9 was to identify the presence and extent of physical respondent and workplace barriers hindering the transfer of learning to the job. In the instrument location labeled Application to the Job, respondents were given a list of eight specific barriers plus an Other to respond to. They were asked to circle the most appropriate response on a scale numbered from 0 through 5 in increments of 1. Labels of None, Low, Medium and High were associated with the numbers 0, 1, 3 and 5 respectively. The interpretive scale was the same as that described in Objective 2. For each barrier except Other, the number of responses for all courses, combined, ranged from 70 to 73. For Other, the total responses were 18. The results are listed in Table 9. For interpretive purposes, the scale labels and the corresponding ranges are footnoted in Table 9.

The barriers in Table 9 are arranged in descending order of the combined mean for all courses with Time as the highest (M = 2.61) and Physical Ability the lowest (M = 0.67). The mean response for Time was at the Medium level for Windows (M = 2.78) and Medium-Low for Word (M = 2.50) and Excel (M = 2.46). With the exception of mean levels for Other, means for all other barriers for all courses fell in the Low range. For Other, the means for Windows and Excel were in the None range and for Word it was Medium-Low (M = 1.80).

Table 10 summarizes participant comments on barriers that were not explicitly included in the instrument checklist. The table is sorted in descending order of total responses to an item. Eighteen total respondents replied. One-quarter (n = 4) of the responses listed "software not available" as a barrier to learning transfer. Of these responses, two were for Word and one each was for Windows and Excel. Almost 19% (n = 3) of the respondents listed "have not applied to job" as a barrier. Two were for Excel and one was for Windows. Just over 12% (n = 2) responded that "time to learn" was a barrier. One was in Word and one in Excel. The remaining seven comments
### Table 9

**Mean Levels of Physical Respondent and Workplace Barriers Hindering Transfer of Course Content to the Job, Sequenced by Total Mean for Each Item**

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Windows</th>
<th></th>
<th></th>
<th>Word</th>
<th></th>
<th></th>
<th>Excel</th>
<th></th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M</td>
<td>SD</td>
<td>n</td>
<td>M</td>
<td>SD</td>
<td>n</td>
<td>M</td>
<td>SD</td>
<td>M</td>
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<td>32</td>
<td>2.78</td>
<td>1.77</td>
<td>16</td>
<td>2.50</td>
<td>1.51</td>
<td>24</td>
<td>2.46</td>
<td>1.56</td>
<td>2.61</td>
</tr>
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<td>Equipment</td>
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<td>1.66</td>
<td>16</td>
<td>1.06</td>
<td>1.73</td>
<td>24</td>
<td>1.25</td>
<td>1.80</td>
<td>1.27</td>
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<td>Tools</td>
<td>33</td>
<td>1.15</td>
<td>1.62</td>
<td>16</td>
<td>.75</td>
<td>1.07</td>
<td>24</td>
<td>1.04</td>
<td>1.55</td>
<td>1.00</td>
</tr>
<tr>
<td>Workspace</td>
<td>33</td>
<td>1.18</td>
<td>1.55</td>
<td>16</td>
<td>.56</td>
<td>.89</td>
<td>24</td>
<td>1.04</td>
<td>1.71</td>
<td>1.00</td>
</tr>
<tr>
<td>Budget</td>
<td>32</td>
<td>.97</td>
<td>1.45</td>
<td>16</td>
<td>.75</td>
<td>1.07</td>
<td>24</td>
<td>1.13</td>
<td>1.48</td>
<td>.97</td>
</tr>
<tr>
<td>Reassignment</td>
<td>31</td>
<td>.55</td>
<td>1.26</td>
<td>15</td>
<td>.53</td>
<td>1.30</td>
<td>24</td>
<td>1.38</td>
<td>1.84</td>
<td>.83</td>
</tr>
<tr>
<td>Staffing</td>
<td>33</td>
<td>.88</td>
<td>1.32</td>
<td>16</td>
<td>.56</td>
<td>1.21</td>
<td>23</td>
<td>.74</td>
<td>1.29</td>
<td>.76</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>.50</td>
<td>1.41</td>
<td>5</td>
<td>1.80</td>
<td>2.49</td>
<td>5</td>
<td>.00</td>
<td>.00</td>
<td>.72</td>
</tr>
<tr>
<td>Physical ability</td>
<td>33</td>
<td>.67</td>
<td>1.29</td>
<td>16</td>
<td>.75</td>
<td>1.29</td>
<td>24</td>
<td>.63</td>
<td>1.01</td>
<td>.67</td>
</tr>
</tbody>
</table>

**Note:** The scale ranged from 0 to 5 in increments of 1. Scale labels were 0 = None, 1 = Low, 3 = Medium and 5 = High. Mean scores were interpreted as follows: 0 - .5 None, >.5 - 1.5 Low, >1.5 - 2.5 Medium-Low, >2.5 - 3.5 Medium, >3.5 - 4.5 Medium-High, >4.5 - 5 High.

The respondents who commented that software was not available also rated similar categories as barriers to learning transfer. The one respondent for Windows rated the
Table 10

Barriers to Applying Course Content to the Job

<table>
<thead>
<tr>
<th>Comment</th>
<th>Windows</th>
<th>Word</th>
<th>Excel</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Software not available</td>
<td>1</td>
<td>6.3</td>
<td>2</td>
<td>12.5</td>
</tr>
<tr>
<td>Have not applied to job</td>
<td>1</td>
<td>6.3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Need time to learn</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>6.3</td>
</tr>
<tr>
<td>Hardware not available</td>
<td>1</td>
<td>6.3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Needed Windows prior to course</td>
<td>1</td>
<td>6.3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Never learned to type</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>6.3</td>
</tr>
<tr>
<td>Delay in resolving computer problems</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>6.3</td>
</tr>
<tr>
<td>Did not use until department did</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>6.3</td>
</tr>
<tr>
<td>Use Lotus 123</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>No technical support</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>25.0</td>
<td>6</td>
<td>37.5</td>
</tr>
</tbody>
</table>

level for both equipment and tools as a High barrier. Both Word respondents rated equipment as High. One also rated tools as Medium and Other as High and commented that "software not available" explained the rating in Other. The one Excel respondent rated equipment as Medium-Low and tools as Medium-High. None of these respondents commented that equipment was a barrier so it follows that the respondents associated both equipment and tools as categories for commenting on
software not being available. Thus, for those that did not have software available on the job, they found a related barrier and rated it as High or Medium-High.

Objective 10 was to estimate the impact of course content on the respondent's work product in terms of productivity and quality. In the instrument section labeled Application to the Job, respondents were asked to circle the most appropriate response on a scale numbered from 0 through 5 in increments of 1. Labels of None, Low, Medium and High were associated with the numbers 0, 1, 3 and 5 respectively. When responding to either the productivity or quality component, respondents were offered one of two scales to respond to, but not both. These scales were labeled Increased to represent an overall positive level of impact and Decreased to represent an overall negative level of impact. For the statistical analysis, the two scales were combined at the 0 point (None) and extended from -1 to -5 for Decreased and 1 to 5 for Increased, yielding one scale with 11 points. In spite of the instructions to the contrary, one participant responded to both scales for each of the productivity and quality dimensions. The conflicting responses were coded to missing for this analysis. The results are listed in Table 11. For interpretive purposes, the scale labels and the corresponding ranges are footnoted in Table 11.

Sixty-nine responses to productivity were included in Table 11. Mean responses for all three courses were Medium-Low on the Increased side of the scale. Excel had the highest mean response ($M = 2.48$) and Word had the lowest ($M = 1.93$).

Seventy responses to quality were included in Table 11. All three responses fell on the Increased side of the scale. The mean response for Excel was Medium ($M = 2.62$) and Medium-Low for both Windows ($M = 2.15$) and Word ($M = 1.87$).

Work product, the combination of productivity and quality, is shown in Table 11. The work product mean for Excel was Medium ($M = 2.55$) and Medium-Low for
Table 11

Mean Levels of Responses Estimating the Impact of Course Content on Respondent's Work Product as Defined by Productivity and Quality Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Windows</th>
<th></th>
<th></th>
<th>Word</th>
<th></th>
<th></th>
<th>Excel</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M</td>
<td>SD</td>
<td>n</td>
<td>M</td>
<td>SD</td>
<td>n</td>
<td>M</td>
</tr>
<tr>
<td>Productivity</td>
<td>33</td>
<td>2.18a</td>
<td>1.65</td>
<td>15</td>
<td>1.93c</td>
<td>2.46</td>
<td>21</td>
<td>2.48d</td>
</tr>
<tr>
<td>Quality</td>
<td>34</td>
<td>2.15b</td>
<td>1.64</td>
<td>15</td>
<td>1.87c</td>
<td>2.36</td>
<td>21</td>
<td>2.62d</td>
</tr>
<tr>
<td>Work producte</td>
<td></td>
<td>2.13</td>
<td>1.59</td>
<td>15</td>
<td>1.90</td>
<td>2.39</td>
<td></td>
<td>2.55</td>
</tr>
</tbody>
</table>

Note: The scale was an 11-point scale, ranging from -5 to 5 in 1-point increments with a neutral center point at 0. The absolute values of the scale ranges used to interpret mean scores was 0 - .5 neutral, >0.5 - 1.5 Low, >1.5 - 2.5 Medium-Low, >2.5 - 3.5 Medium, >3.5 - 4.5 Medium-High, >4.5 - 5 High. A positive mean indicates that productivity or quality increased as a result of applying course content. A negative mean indicates that productivity or quality decreased as a result of applying course content.

a Range was -1 (one response) to 4. b Range was -1 (one response) to 5. c Range was -3 (one response at -3, 2 responses at -1) to 5. d Range was 0 to 5. e Work product is the combined mean for productivity and quality.

Windows (M = 2.13) and Word (M = 1.90). Both the productivity and quality means within each software course were similar to each other.

Objective 11 was to estimate the percentage of time the participant had the opportunity to apply the course content. In the instrument section labeled Application to the Job, respondents were asked to estimate the percentage of time in a typical week they could have applied the course content to their jobs. They were asked to select from a scale that had a 0% anchor point and then ranged from 1% to 100% in five 20% increments. The scale increments were labeled None for 0%, Low for 1 - 20%,
Medium for 41 - 60% and High for 81 - 100%. The labels High and Medium were stretched so that they met over the 61 - 80% increment. The labels Medium and Low were stretched so that they met over the 21 - 40% increment. This visually established the 61 - 80% increment as Medium-High and the 21 - 40% increment as Medium-Low. In order to calculate mean and standard deviation, the responses were transformed by converting the scale increments to their midpoints: 0% = 0%, 1 - 20% = 10.5%, 21 - 40% = 30.5%, 41 - 60% = 50.5%, 61 - 80% = 70.5%, 81 - 100% = 90.5%. This conversion was necessary to interpret the responses for Objective 12, which were dependent on the responses to this objective and is discussed later. There were 72 total respondents. The results are listed in Table 12.

There were several reasons why the researcher chose to treat the ordinal scale data as interval:

1. The expert panel found asking for a numeric response to be confusing; using an incremental response scale added readability and clarity. This was confirmed in the review with the focus group.

2. Single point numeric responses would not add precision since the responses were subjective in nature.

3. Using the ranges standardized the responses. In essence, this technique simply identifies for the respondent what values were included in each scale ordinal and established a fixed difference between each range.

4. Part of the objective was to understand whether the difference in pre- and post-application time was significant and estimate how much that difference was. A Chi-square would identify significance but not amount. This insured that a finding of a significant difference also had a practical size dimension. In addition, this technique allowed the researcher to develop an estimate of how much the software was used relative to how much opportunity there was to use it.
Table 12

Mean Levels of the Percentage of Opportunity Time, Pre-Post Application Time, and Application Gain

<table>
<thead>
<tr>
<th></th>
<th>Windows</th>
<th></th>
<th>Word</th>
<th></th>
<th>Excel</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M&lt;sup&gt;a&lt;/sup&gt;</td>
<td>SD&lt;sup&gt;a&lt;/sup&gt;</td>
<td>n</td>
<td>M&lt;sup&gt;a&lt;/sup&gt;</td>
<td>SD&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Opportunity time</td>
<td>33</td>
<td>40.8</td>
<td>25.1</td>
<td>15</td>
<td>30.5</td>
<td>20.0</td>
</tr>
<tr>
<td>Post-course application</td>
<td>24&lt;sup&gt;b&lt;/sup&gt;</td>
<td>18.6</td>
<td>18.8</td>
<td>12&lt;sup&gt;c&lt;/sup&gt;</td>
<td>10.1</td>
<td>11.2</td>
</tr>
<tr>
<td>Pre-course application</td>
<td>24</td>
<td>8.7</td>
<td>18.8</td>
<td>12</td>
<td>4.3</td>
<td>7.2</td>
</tr>
<tr>
<td>Application gain</td>
<td>9.9</td>
<td>12.0</td>
<td></td>
<td>5.8</td>
<td>4.9</td>
<td></td>
</tr>
<tr>
<td>Ratio post- to pre-course</td>
<td>2.1</td>
<td></td>
<td></td>
<td>2.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent utilization&lt;sup&gt;e&lt;/sup&gt;</td>
<td>45.5%</td>
<td></td>
<td></td>
<td>33.1%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Scale for mean % scores is 0 - None, >0 - 20 Low, >20 - 40 Medium-Low, >40 - 60 Medium, >60 - 80 Medium-High, >80 - 100 High. Some subjects did not enter a response for pre-course application. To produce the most conservative results, these were coded as missing and the matching post-course response was dropped from the analysis.  
<sup>a</sup>% of total work time. <sup>b</sup>7 missing pre-course entries. <sup>c</sup>2 missing pre-course entries. <sup>d</sup>4 missing pre-course entries. <sup>e</sup>Post-course application/opportunity time.

5. Finally, objectives 17 and 18 of the study required that application gain be dealt with as interval data.

Windows respondents reported the highest mean percentage opportunity time. It fell in the Medium range (M = 40.8). The Medium-Low range included both Excel (M = 38.8) and Word (M = 30.5). The lowest standard deviation was for Word (SD =
20.0), which corresponds to the width of one scale increment. Excel had the highest (SD = 28.2).

Objective 12 was to estimate the percentage of opportunity time the respondents actually applied the course content both before and after attending the course, determine the pre- and post-course application time difference and whether it was significant. Thus, the pre- and post-course percentage application times were each products of multiplying percentage opportunity time by the appropriate percentage application time. The scale ranges and midpoints for the pre- and post-application times responses were identical to that used for percentage opportunity time. The actual products were produced by multiplying the midpoints of the opportunity ranges by the midpoints of the appropriate application time. Means and standard deviations were calculated on the results. Finally, to determine the difference between pre- and post-application time, their respective means were subtracted and the result labeled Application Gain. Some subjects did not enter responses for pre-course application time. To produce the most conservative results, their post-course application time entry was dropped from the analysis. Thus, only complete pairs of data were included in calculating the differences and significance.

As shown in Table 12, pre-course application times were in the Low range for all three courses, with Word having the lowest mean (M = 4.3) to Windows having the highest (M = 8.7). Post-course application time remained in the Low range for Windows (M = 18.6) and Word (M = 11.2). It was in the Medium-Low range for Excel (M = 21.4). Mean application gain for Word was 5.8, for Windows was 9.9 and for Excel was 13.5. Table 12 shows that the ratio of post-course to pre-course application time yielded an increase in usage of 2.1 times for Windows, 2.3 times for Word and 2.7 times for Excel.
Defining percent utilization as the ratio of post-course application time to opportunity time showed that the software was underutilized. As shown in Table 12, Windows and Excel were utilized roughly one-half of the opportunity time and Word was utilized only one-third of the opportunity time.

The significance of the pre- and post-application time differences is reported in Table 13. A paired t-test was performed to test for differences within a course. All three course differences were significant to at least the 0.05 level. The difference in Excel was significant at the 0.05 level while the differences in Windows and Word were significant at the 0.01 level.

The 95% lower and upper confidence limits were calculated for application gain by course and reported in Table 14. The 95% confidence interval for Windows was 5.1 (M = 9.9), for Word was 3.1 (M = 5.8) and for Excel was 10.5 (M = 13.5).

Objective 13 was to determine the respondents' satisfaction with how well the overall course met their related job needs. In the instrument location labeled Application to the Job, respondents were asked to circle the most appropriate response on a scale numbered from 0 through 5 in increments of 1. Labels of None, Low, Medium and High were associated with the numbers 0, 1, 3 and 5 respectively. The interpretive scale was the same as that described in Objective 2. Seventy-four responses were obtained for this objective. The results are reported in Table 15. For interpretive purposes, the scale labels and the corresponding ranges are footnoted in Table 15. For all three courses, the mean response was in the Medium range. For Windows, it was exactly at the range midpoint (M = 3.0). Both Word and Windows were exactly at the upper boundary limit of the range (M = 3.5).

Objective 14 was to determine if there were any content areas that should have been included in the course but were not. Respondents were asked to respond to an open-ended question that asked them to list at least one content area that should have
Table 13

Significance of the Difference Between Pre- and Post-Application Times

<table>
<thead>
<tr>
<th></th>
<th>Windows</th>
<th></th>
<th></th>
<th>Word</th>
<th></th>
<th></th>
<th>Excel</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>df</td>
<td>t</td>
<td>M</td>
<td>df</td>
<td>t</td>
<td>M</td>
<td>df</td>
</tr>
<tr>
<td>Post-course application</td>
<td>18.6</td>
<td>10.1</td>
<td>21.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-course application</td>
<td>8.7</td>
<td>4.3</td>
<td>7.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>4.04**</td>
<td>11</td>
<td>4.03**</td>
<td>19</td>
<td>2.70*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: \( \alpha = .05 \), 2-tailed.

\*p < .05. \**p < .01

Table 14

Lower and Upper Confidence Limits Around Mean Application Gain Within Course

<table>
<thead>
<tr>
<th></th>
<th>Windowsa</th>
<th>Wordb</th>
<th>Excelc</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LCL</td>
<td>M</td>
<td>UCL</td>
</tr>
<tr>
<td></td>
<td>4.8</td>
<td>9.9</td>
<td>15.0</td>
</tr>
</tbody>
</table>

Note: LCL is lower confidence limit. UCL is upper confidence limit. \( \alpha = .05 \), 2-tailed.

\( a_t = 2.069, \ df = 23, SD = 12.0 \). \( b_t = 2.201, \ df = 11, SD = 4.9 \). \( c_t = 2.093, \ df = 19, SD = 22.4 \).

been included in the course that would have significantly improved their job performance. The question was part of the section of the instrument titled Customer
Table 15

Mean Levels of Respondent's Satisfaction With How Well the Overall Course Met Their Related Job Needs

<table>
<thead>
<tr>
<th></th>
<th>Windows</th>
<th></th>
<th>Word</th>
<th></th>
<th>Excel</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>M</td>
<td>SD</td>
<td>n</td>
<td>M</td>
<td>SD</td>
<td>n</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>35</td>
<td>3.0</td>
<td>1.31</td>
<td>16</td>
<td>3.5</td>
<td>1.16</td>
</tr>
</tbody>
</table>

**Note:** The scale ranged from 0 to 5 in increments of 1. Scale labels were 0 = None, 1 = Low, 3 = Medium and 5 = High. Mean scores were interpreted as follows: 0-.5 None, >0.5 - 1.5 Low, >1.5 - 2.5 Medium-Low, >2.5 - 3.5 Medium, >3.5 - 4.5 Medium-High, >4.5 - 5 High.

Recommendations/Course Impact. Twenty-four responses were obtained. They were compiled and summarized by course in Table 16.

Excel had the highest total responses (45.8%), followed by Word (29.2%) and Windows (25.0%). Individual content areas that represented at least 10% of the total comments were found in Word and Excel. For Excel, respondents requested the addition of graphing (25.0%) and file importing and converting (12.5%). For Word, respondents requested adding content dealing with tables and columns (12.5%). There were an additional seven content areas, as displayed in Table 16. No course received more than 10% of the responses in any of the listed content areas beyond those just listed.

Objective 15 was to identify suggested improvements to the course. Respondents were asked to respond to an open-ended question that asked them to recommend at least one additional change to significantly improve the course. The question was part
Table 16

**Suggested Content Areas That Should Be Added, by Course to Significantly Improve Respondent's Job Performance**

<table>
<thead>
<tr>
<th>Comment</th>
<th>Windows</th>
<th>Word</th>
<th>Excel</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Graphing</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>File importing and converting</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>8.3</td>
</tr>
<tr>
<td>Cut/paste into other applications</td>
<td>2</td>
<td>8.3</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Tables and columns</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>12.5</td>
</tr>
<tr>
<td>Better instructions on notepad</td>
<td>2</td>
<td>8.3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sending/receiving files via Rhumba</td>
<td>1</td>
<td>4.2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Desktop and print manager</td>
<td>1</td>
<td>4.2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Setting document defaults</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Organize filing system</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>Least squares data fitting</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>6</td>
<td>25.0</td>
<td>7</td>
<td>29.2</td>
</tr>
</tbody>
</table>

of the same section of the instrument as Objective 14. Forty-four responses were obtained. They were compiled and summarized by course in Table 17.

Windows had the highest total responses (50.0%), followed by Excel (27.3%) and Word (22.7%). There were three improvements recommended that were found across all three courses. These three recommendations also represented the highest number of
Table 17

**Recommended Improvements to Significantly Improve Course**

<table>
<thead>
<tr>
<th>Comment</th>
<th>Windows</th>
<th>Word</th>
<th>Excel</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allow more time for the course</td>
<td>11</td>
<td>4</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Incorporate more practice</td>
<td>6</td>
<td>2</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>More work-related examples</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Reduce review of Windows/keyboard</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Increase frequency of course offerings</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Provide manuals before class</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Teacher did not address all questions</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>More computers/better room setup</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Separate clerical from field personnel</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Needed more advanced course</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>22</td>
<td>10</td>
<td>12</td>
<td>44</td>
</tr>
</tbody>
</table>

responses. "Allowing more time for the course" represented 36.4% of the total comments, followed by "incorporating more practice" (27.3%) and "more work-related examples" (13.6%). For each of these three recommendations, Windows had the highest response with 25.0% for "time," 13.6% for "practice" and 6.8% for "work-related examples." Word had a 9.1% response for "time" and Excel had a 9.1% response for "practice." There were an additional seven areas of recommendation, as
displayed in Table 17. No course received more than a 4.5% response in any of the listed content areas beyond those just listed.

Objective 16 was to identify significant respondent or organizational changes resulting from applying the course content. Respondents were asked to respond to an open-ended question that asked them to identify at least one significant change to either themselves or their immediate supervised work unit from applying the course content. The question was part of the same section of the instrument as Objective 14. Twenty-four responses were obtained. They were compiled and summarized by course in Table 18.

Excel had the highest total responses (41.7%), followed by Windows (37.5%) and Word (20.8%). No single area of response was found across all three courses. The area with the highest response was "improved quality, editing and data entry" in Excel (25.0%) followed by "work faster, more efficiently" in Excel (12.5%) and "savings from multitasking" in Windows (12.5%). Of the total seven areas of response, close to 85% of the responses were made in these four: (a) "improved quality, editing, data entry" (33.3%); (b) "work faster, more efficiently " (20.8%); (c) "less dependence on staff support" (16.7%); and (d) "savings from multitasking" (12.5%). The remaining responses were spread over the three courses in three additional areas.

An open-ended response was included at the end of the Customer Recommendations/Course Impact Section for general respondent comments. Eighteen responses were obtained. They were compiled and summarized by course in Table 19. Windows had the highest total responses (50.0%), followed by Word (27.8%) and Excel (22.2%). Two response areas were found in all three courses. These two areas represented the two highest response areas. The highest was survey too far after course (38.9%). Windows and Word each contributed 16.7% toward this total. Based on demographic data for course and instructor obtained from the returned instruments,
Table 18

**Significant Respondent or Organizational Changes Resulting from Respondent or Immediate Supervised Work Unit Applying the Course Content**

<table>
<thead>
<tr>
<th>Comment</th>
<th>Windows</th>
<th></th>
<th>Word</th>
<th></th>
<th>Excel</th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Improved quality, editing, data entry</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>8.3</td>
<td>6</td>
<td>25.0</td>
<td>8</td>
</tr>
<tr>
<td>Work faster, more efficiently</td>
<td>2</td>
<td>8.3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>12.5</td>
<td>5</td>
</tr>
<tr>
<td>Less dependence on staff support</td>
<td>2</td>
<td>8.3</td>
<td>2</td>
<td>8.3</td>
<td>-</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Savings from multitasking</td>
<td>3</td>
<td>12.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Compatible with work groups</td>
<td>1</td>
<td>4.2</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>4.2</td>
<td>2</td>
</tr>
<tr>
<td>Job requires substantial computer use</td>
<td>1</td>
<td>4.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Better understand Windows environ</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>4.2</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>37.5</td>
<td>5</td>
<td>20.8</td>
<td>10</td>
<td>41.7</td>
<td>24</td>
</tr>
</tbody>
</table>

The longest elapsed times that could have represented these respondents were 7 months for 1 respondent, 6 months for 3 respondents, 5 months for 2 respondents and 4 months for 1 respondent. Two additional comments for this area were excluded from this study because of the lack of any qualitative data being returned on the respondents instruments.

The second highest response area was helpful course/informed teacher (22.2%). Half the responses for helpful course/informed teacher (11.1%) were associated with
Table 19

General Participant Comments

<table>
<thead>
<tr>
<th>Comment</th>
<th>Windows</th>
<th></th>
<th></th>
<th>Excel</th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Survey too far after course&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3</td>
<td>16.7</td>
<td>3</td>
<td>16.7</td>
<td>1</td>
<td>5.6</td>
<td>7</td>
</tr>
<tr>
<td>Helpful course, informed teacher</td>
<td>2</td>
<td>11.1</td>
<td>1</td>
<td>5.6</td>
<td>1</td>
<td>5.6</td>
<td>4</td>
</tr>
<tr>
<td>Tables worse than WordPerfect</td>
<td>1</td>
<td>5.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Learned more through trial and error</td>
<td>1</td>
<td>5.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Not sure productivity increased</td>
<td>1</td>
<td>5.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Course was for self-improvement</td>
<td>1</td>
<td>5.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Had to move to Word</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>5.6</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Need book to apply content</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>5.6</td>
<td>1</td>
</tr>
<tr>
<td>Need computer basics</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>5.6</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>50.0</td>
<td>5</td>
<td>27.8</td>
<td>4</td>
<td>22.2</td>
<td>18</td>
</tr>
</tbody>
</table>

<sup>a</sup>Two additional comments for this item were excluded from this study because of the lack of any qualitative data being returned by the respondent.

Windows. There were seven additional response areas representing only one response for only one course in any of them.

Objective 17 was to determine if there were any significant differences in application gain between Job Classification and Reporting Organization. Only two of the three reporting organizations were included in this analysis. The third, Organization C, was excluded because there were only two responses representing that
A 2-factor, independent measures ANOVA was performed using application gain as the dependent variable. A statistical adjustment was made using the regression approach to adjust for an unbalanced design. The results of the test are displayed in Table 20. Due to empty cells, no interaction effect was calculated. None of the $F$ values were found to be significant at the 0.05 level. This test found no significant difference in application gain across either job class or reporting organization.

Objective 18 was to determine the strength of the relationship between the independent variable application gain and the dependent work product variables of productivity and quality. Since the dependent variables were treated as ordinal data for this analysis, Kendall's tau-b was selected to adjust for possible tied ranks. The results are reported in the first section of Table 21. No significance was found for either variable in Excel. The relationships for Windows and Word were all significant. With the exception of quality for Windows, both productivity and quality variables were found to be significant at the 0.05 level. The quality relationship for Windows was found to be significant at the 0.01 level.

Objective 18 was also to determine the strength of the relationship between the independent variables of peer support, supervisor support and satisfaction and the dependent variable application gain. Since the independent variables were treated as ordinal data for this analysis, Kendall's tau-b was selected to adjust for possible tied ranks. The results are reported in the second and third sections of Table 21.

The second section of Table 21 addresses support. In all cases, except for supervisor support in Excel, there was no significant relationship between supervisor or peer support and application gain. Supervisor support in Excel was significant at the 0.05 level.
Table 20

Results of Tests for Significance of Differences In Application Gain Between Job Classification and Reporting Organization

<table>
<thead>
<tr>
<th></th>
<th>Windows df</th>
<th>F</th>
<th>Windows df</th>
<th>F</th>
<th>Windows df</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job class</td>
<td>5,16</td>
<td>.892</td>
<td>4,6</td>
<td>.606</td>
<td>4,12</td>
<td>1.157</td>
</tr>
<tr>
<td>Reporting org.</td>
<td>1,16</td>
<td>.082</td>
<td>1,6</td>
<td>.588</td>
<td>1,12</td>
<td>.565</td>
</tr>
</tbody>
</table>

Note. An ANOVA was performed using METHOD=UNIQUE in the SPSS statistical software to adjust for an unbalanced design. Due to empty cells, the interaction effect was not calculated. For the test of significance, $\alpha = .05$, 2-tailed. No significance was found at or below the .05 level. Only 2 of the 3 reporting organizations were included in this analysis. The third, Organization C, was excluded because there were only 2 responses representing that organization.

The third section of Table 21 displays the strength of the relationship between overall course satisfaction with how well the course met related job needs and gain. The relationship was significant at the 0.05 level for Word and Excel. There was no significance for Windows.

Objective 19 was to determine if there was a statistically significant difference between instructors for the understanding and confidence components of the course objectives, the use of work-related examples, practice and discussion and the overall respondent satisfaction with the instructional methods used. These elements were all found in the Course Objectives/Instruction section of the instrument. The understanding and confidence components were combined across all course learning objectives. An ANOVA was performed comparing instructor differences for each
Table 21

Strength and Significance of the Relationship Between the Variable Application Gain and the Components of Organizational Support, Work Product, and Overall Satisfaction, by Course

<table>
<thead>
<tr>
<th></th>
<th>Windows</th>
<th>Word</th>
<th>Excel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>r</td>
<td>n</td>
</tr>
<tr>
<td>Work product^a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Productivity</td>
<td>23</td>
<td>.388*</td>
<td>11</td>
</tr>
<tr>
<td>Quality</td>
<td>24</td>
<td>.513**</td>
<td>11</td>
</tr>
<tr>
<td>Support^b</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervisor</td>
<td>21</td>
<td>.256</td>
<td>12</td>
</tr>
<tr>
<td>Overall satisfaction^b</td>
<td>24</td>
<td>.303</td>
<td>12</td>
</tr>
</tbody>
</table>

Note. Kendall's tau-b was used to calculate r, with α = .05, 2-tailed.  
^aApplication gain is the independent variable.  
^bApplication gain is the dependent variable.  
*p < .05.  **p < .01

There were no cases where the differences tested as significant at the 0.05 level or lower.
Table 22

Results of Tests for Significance of Differences Between Instructors in the Course Objectives/Instruction Section of the Instrument\(^a\)

<table>
<thead>
<tr>
<th></th>
<th>Windows</th>
<th></th>
<th>Word</th>
<th></th>
<th>Excel</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>df</td>
<td>F</td>
<td>df</td>
<td>F</td>
<td>df</td>
<td>F</td>
</tr>
<tr>
<td>Mean understanding(^b)</td>
<td>6,27</td>
<td>.930</td>
<td>6,9</td>
<td>.348</td>
<td>6,16</td>
<td>.279</td>
</tr>
<tr>
<td>Mean confidence(^b)</td>
<td>6,27</td>
<td>.478</td>
<td>6,9</td>
<td>.106</td>
<td>6,16</td>
<td>.444</td>
</tr>
<tr>
<td>Examples</td>
<td>6,26</td>
<td>.423</td>
<td>6,8</td>
<td>.801</td>
<td>6,15</td>
<td>.616</td>
</tr>
<tr>
<td>Discussion</td>
<td>6,26</td>
<td>.940</td>
<td>6,9</td>
<td>.122</td>
<td>6,16</td>
<td>.272</td>
</tr>
<tr>
<td>Practice</td>
<td>6,26</td>
<td>.096</td>
<td>6,9</td>
<td>.160</td>
<td>6,16</td>
<td>.222</td>
</tr>
<tr>
<td>Instructional methods</td>
<td>6,26</td>
<td>.164</td>
<td>6,9</td>
<td>.562</td>
<td>6,16</td>
<td>.305</td>
</tr>
</tbody>
</table>

Note. For the test of significance, \(\alpha = .05\), 2-tailed. No significance was found at or below the .05 level for any of the tests.
\(^a\)Excludes the Importance dimension since it is not attributable to the instructor.
\(^b\)The means for understanding and confidence were separately combined across all learning objectives for this analysis.
CHAPTER 5: SUMMARY

Objectives

The primary purpose of this study was to develop a simple, low-cost, easy to administer and simple to score post-course survey instrument that examines participant perceptions and differences in several areas. The instrument takes into consideration participant perceptions of the influence of certain factors identified in relevant literature as affecting the transfer of learning to the workplace. The general categories that these factors belonged to were (a) course delivery, (b) course participant involvement, (c) course construction, (d) job relevance, (e) participant confidence, (f) organizational support, and (g) environmental barriers.

It also examines participant perceptions of the level of application of the course learnings before and after the course, their impact on work product and any significant individual or organizational changes resulting from them. Finally, the instrument design was used to determine if significant differences in learning existed across certain respondent demographics and whether there was a relationship between learning and selected workplace factors.

The specific objectives of the study were to:

1. Describe the respondent demographics for course attended, instructor, job classification and local reporting organization.

2. Determine how well the major enabling and terminal course objectives were understood by the respondents.

3. Determine how important these course objectives were to job performance.

4. Determine the respondents' confidence in their ability to apply these objectives to their jobs.

5. Determine the extent that course examples relating to the respondents' job were used.
6. Determine the extent that respondent involvement through discussion and practice was incorporated in the course design.

7. Determine how satisfied the respondents were with course instructional methods.

8. Describe the level of supervisor and peer support for applying the course content to the job.

9. Identify the presence and extent of physical respondent and workplace barriers hindering the transfer of course content to the job.

10. Estimate the impact of course content on the respondents' work product in terms of productivity and quality.

11. Estimate the percentage of time the respondent had the opportunity to apply the course content.

12. Estimate the percentage of opportunity time the respondent applied the course content before and after attending the course. Calculate the difference in pre-post application time as Application Gain and determine if it was significant.

13. Determine the respondents' satisfaction with how well the overall course met their related job needs.

14. Determine if there were any content areas that should have been included in the course but were not.

15. Identify suggested improvements to the course.

16. Identify significant respondent or organizational changes resulting from applying the course content.

17. Determine if there were any statistically significant differences in application gain between Job Classification and Local Reporting Organization.

18. Determine if there was a relationship between application gain and organizational support, work product or job relevance.
19. Determine if there was a statistically significant difference between instructors for the understanding and confidence components of the course objectives, the use of work-related examples, practice and discussion and the overall respondent satisfaction with the instructional methods used.

Procedures

The target population of this study were employees from three separate plant sites in a Louisiana petrochemical complex: two manufacturing sites and one research facility. These employees had attended at least one introductory Microsoft course within the last seven months: Microsoft Windows, Microsoft Word or Microsoft Excel. These courses were all taught at the complex training facilities by the same vendor.

The researcher developed a draft instrument, and sent it to a validation panel of selected experts for review. After incorporating their comments, a focus group of individuals who had taken one of the courses was assembled to review the instrument. Their comments were incorporated into the instrument which was then sent out to the sample.

The sampling plan included 150 course participants. Letters were sent to each employee's supervisor asking that the supervisor encourage the employee to complete the survey and return it to the training administrator. A cover letter was included for each participant to encourage them to return the instrument. All participants were assured that their individual responses would remain anonymous. No personal data was solicited. Organizational and job demographics were collected to meet study objectives and to validate the quality of the response data. An initial response of 56% was obtained. After eliminating invalid responses, the final response rate was 50%. Because the final number of responses was higher than the required sample size, no follow-up for non-responses was conducted. In order to keep the costs of administering the instrument low, it was anticipated that future administrations of the
The instrument would only do a follow-up if necessary to reach the required sample size. It was elected to not perform a follow-up in this study to most accurately reflect this strategy.

The instrument included closed- and open-ended responses. The closed-ended responses were coded and entered into a mainframe program for statistical analysis. The open-ended responses were entered into a PC database for ease of compilation and aggregation.

Conclusions, Major Findings and Recommendations

Thirteen conclusions follow that are based on the findings of this study. Each numbered entry represents a study conclusion. Each entry begins with the conclusion and is followed by the supporting findings and any relevant observations. Study recommendations are included at the end of each item, where warranted.

1. No instructor differences were found in delivering course objectives, making use of job-related examples, practice, discussion, or instructional method used. The findings indicated no significant differences in any of the measurements among the instructors. This was consistent with expectations because the vendor who delivered the training was nationally franchised, used standardized materials customized to the client, and served a large customer base. A relatively large number of instructors were included in this study.

2. Peer support did not influence application gain. Supervisor support did not influence application gain for either Word or Windows. The findings indicated no significant relationship between these components of organizational support and application gain. The mean levels of peer support ranged from Medium-Low to Medium. The mean level of supervisor support for Word and Windows was Medium. It is interesting to note that, although the mean rated level of supervisor support for Excel was Medium-Low, this was the only case where the relationship between
supervisor support and application gain was significant. The general lack of a significant relationship would support Herzberg, Mausner and Snyderman's (1959) conclusion that these are hygienic rather than motivational factors. It is recommended that additional studies be made to determine the conditions under which peer and supervisor support influence application gain. These studies should test the influence on application gain of various levels of organizational on-the-job expectation and follow-up for applying the course software. Both the supportive and unsupportive dimensions should be explored to determine if there is a tolerance range before any significant influence occurs.

3. Application gain was not a function of either job classification or reporting organization. The findings showed no significant differences in application gain for any of the computer software programs by either job classification or reporting organization. Based on these findings, there did not appear to be any cultural influences attributable to application gain.

4. The courses generally addressed the participant's perceived work needs. Several of the findings supported this conclusion. First, mean levels of satisfaction with the course relative to job needs were in the Medium range, one in the center and two at the upper limit of this range. Second, application gain was directly and significantly related to satisfaction in two out of three courses. One would not expect a significant gain if the course did not address participant needs. Third, no significant differences in application gain were found either by job classification or reporting organization. This suggests that the courses addressed the combined needs of a diverse population. Some open-ended responses noted that participants were able to work faster and more efficiently and that the software gave them improved document quality, editing and data entry. A few comments also complimented the course and the instructor.
5. General course improvements could be made in the use of practice, job-related examples and course length. The findings established that the areas of greatest needed improvement were related to course length and the use of more job-related examples and practice. Although these comments had more responses for some courses than others, depending on the specific response, incorporating combinations of these three elements requires reviewing all the course designs.

Both job-related examples and practice were rated at a Medium level. Opportunities for discussion and satisfaction with instructional methods were rated at a Medium-High level and were not associated with any comments for improvement. This may suggest that a Medium-High level of response for course-specific items in the instrument is a minimum acceptable threshold. In support of this statement, only Windows had multiple objectives rated below Medium-High. The responses to recommended course improvements for Windows were double those for the other two courses. Windows was also the only course where the relationship between application gain and overall satisfaction with the course was not significant. It is recommended that more time be allowed to complete a course, concentrating on using more job-related examples and practice. It is also recommended that those Windows' objectives receiving a Medium or lower rating be reviewed for improvement. Follow-up after modifications should be made with the instrument to determine the impact of these modifications. It is further recommended that future applications of the instrument be reviewed to identify threshold levels that generally extinguish requests to modify or improve the course design and content.

6. Course additions could be made in the content related to Excel. The findings indicated participants requested elements of graphing and file importing and converting be incorporated into Introductory Excel. For Excel, the mean rated levels for all objectives was Medium-High. These findings indicate that, even though all elements of
the course are rated well, there can still be elements missing that the participants consider important. This points out the importance of using the instrument to not only evaluate included content but also to indicate content that should have been included. It is recommended that a course needs assessment be conducted to determine how much of these elements should be incorporated into Introductory Excel and how much should be addressed in higher level Excel courses.

7. Excluding "time" and "availability of software," workplace barriers to learning transfer were of little or no consequence to learning transfer. The findings showed that none of the specified barriers other than time rated more than Low in the responses. Availability of software was written in as comments on barriers by respondents who also rated the levels of the equipment and tools barriers. The written comments also included other items that did not fit within the list of choices of barriers to be rated. It is recommended that future administrations of the instrument include barrier choices that are more specific to the course being evaluated. For instance, replace "equipment" as a barrier with "computer hardware" and "tools" as a barrier with "computer software" when dealing with computer courses. There were other comments that applied to availability of technical and consulting support. It is recommended that these be added to the specified list of barriers to determine the extent of their impact.

8. Software was not available to a number of respondents when they completed the course and returned to the job. Those that commented on lack of availability mostly rated as High the barriers of equipment and/or tools. It is recommended that future course candidates be screened to include only those who have the software available when they return to their jobs from the course.

9. Attending the courses significantly increased utilization of the software. Although participants reported Low level utilization of the software prior to taking the related course, post-course usage increased between two and three times over pre-
course usage. These pre-post-course differences tested as statistically significant in all cases. This indicates that the courses acted as successful learning change agents relative to not taking the course.

10. The software was not being fully utilized back on the job. In the rated barriers to learning transfer, "time" rates on the low end of the Medium range on the average of the three courses. The study findings also indicated that the amount of time the software was utilized on the job was from one-half to one-third of the opportunity time to utilize the software. Just over twelve percent of the open-ended responses on barriers indicated they needed time to learn the software. It is recommended that a focus group be initiated to identify the factors contributing to this under utilization of the software and their relative influence. Based on the results of the focus group, recommendations for change can be developed. Those factors that are of significant influence can also be incorporated into the instrument.

11. For Windows and Word, increased utilization of the software was directly and significantly related to increased levels of productivity and quality. This is consistent with the expectation that increased utilization should improve productivity and quality, especially when the findings show that the software was being used at low levels before the course. The increases in productivity and quality for Excel did not test as significantly related to the increased utilization. The standard deviation around application gain for Excel was much higher than for the other courses. Thus, there was too much variance around these components to test as significantly related.

12. Respondent rating levels in the course-related items were higher than their rating levels for productivity and quality. Mean levels for course-related items in the instrument, including satisfaction, were rated Medium or Medium-High. In addition, there were a number of comments indicating favorable respondent or organizational results from applying the software. Also, with the exception of Excel noted in the
previous conclusion, increased utilization of the software was directly and significantly related to levels of productivity and quality. Compared to the Medium and Medium-High course-related ratings for Windows and Word, rated levels of productivity and quality increases resulting from application of the course software for these courses were Medium-Low in level in all but one case. Respondents also reported under utilization of the software relative to opportunities to apply it. It is recommended that a follow-up instrument be administered after implementation of the study recommendations to determine if rated levels of productivity and quality were influenced by those recommendations. The follow-up would include an analysis to determine which factors, if any, influenced a change in productivity and quality and how much that influence was. Implementing this recommendation may assist in determining a set of course and workplace factors that are of significant influence on productivity and quality of work output.

13. Some participants began reporting difficulty relating back to the course content when they received the instrument more than three months after completing the course. It is recommended that future administrations of the instrument include a response delay of no more than three to four months.

Summary

This instrument was an easy to administer and simple to score method of obtaining post-course feedback on how well the content of three software courses was understood by the participants, met their job needs and transferred to their jobs. The administrative time and costs were low, involving identifying the participants and their supervisors, distributing the instrument, coding the returned instruments and performing analysis on the coded data.

The instrument was able to determine that increased utilization of the software after taking the course was not related to job classification or major reporting
organization. It also showed that there were no significant differences between the instructors that delivered a course. With two exceptions, time to apply software and availability of software, workplace barriers and physical limitations were of little influence on learning transfer. Also, supervisor and peer support did not generally influence post-course usage.

Although the courses generally met participant's work needs, the instrument did point out areas where courses could be strengthened. These areas were time allowed to complete the course, use of practice and job-related examples, and the addition of graphing and file imports and conversions, depending on the course. The instrument proved valuable in identifying content areas that should have been included in a course as well as course content areas that needed strengthening.

The instrument also pointed out that, although the courses significantly increased utilization of the software, the software was not being fully utilized on the job. It also demonstrated that rated levels for course-related items did not translate directly to rated levels for changes in productivity and quality resulting from attending the course.

Much can be done to improve the instrument by further adapting it to the courses in this study and to evaluate training areas other than those in this study. Continued testing of course and workplace interrelationships may yield different results for different learning outcomes that may provide some valuable insights in structuring and assessing expected learning outcomes. In addition, application of the instrument over many different courses may assist organizations to set common expectations for minimum acceptable mean levels of rated performance. This may simplify its use further by reducing the need for regular statistical analyses.

Additional value could be obtained by implementing the course recommendations from this study and returning for a follow-up later to determine if any improvements actually resulted. There is ample opportunity to apply this instrument and refine it
based on experience. As a template, additional applications among a variety of courses will help to define its adaptability. Finally, as the instrument and the data analyses are further refined, there is an opportunity to further reduce time and cost to code and analyze the data by adapting the instrument to scanner technology for data entry.

Educational institutions may find it useful to review their major enabling and terminal objectives linking courses related within programs of study. This could prove valuable by assisting in determining whether participants were receiving the appropriate prerequisite learning foundations and experiences. An instrument could be adapted from the one in this study and administered some months after progression into the next program course. Such an approach would go beyond the typical end-of-course evaluation that is completed at the close of a course by providing a reality check on content, timing and course integration. Programs of study that terminated in employment could be evaluated similarly. The enabling and terminal objectives would be stated in terms of the final expectations of the program. A follow-up with participants some reasonable period after completing the program could provide valuable insight into the program content and structure and its integration into the workplace.
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APPENDIX A: FULL SURVEY FOR WINDOWS

TRAINING EFFECTIVENESS SURVEY

VENDOR ............................................ (vendor name here)
COURSE .................... WINDOWS 3.1 INTRODUCTION
INSTRUCTOR .......................... (instructor name here)

Please return by (enter date here) to:

(address here)
CUSTOMER INFORMATION

Please complete the following information.

**JOB CLASSIFICATION** (check ☑ one):

☐ Wage  
☐ Staff Support  
☐ Engineering Tech, Lab Tech, Inspector, Other Exempt  
☐ Professional  
☐ Temporary and 1st Line Supervisor  
☐ 2nd Line Supervisor  
☐ Manager (Department Head and above)

**LOCAL ORGANIZATION YOU CURRENTLY REPORT TO** (check ☑ one):

☐ Refinery  
☐ Chemical Plant  
☐ Research and Development Lab

Comments on information supplied above?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
COURSE OBJECTIVES/INSTRUCTION

Directions: Please circle the numbered level that is the most appropriate response for each item. Throughout the survey, the scale is Low (1), Medium-Low (2), Medium (3), Medium-High (4) and High (5).

1. OBJECTIVE: Use File Manager to copy, move, delete and rename files, make subdirectories, find files and perform basic file maintenance.

   A. The level of understanding the course gave me for this objective was...
   B. The importance of this objective to performing my job is...
   C. The confidence I have in my ability to apply this objective to my job is...

2. OBJECTIVE: Arrange the PC Desktop for applications and documents, use Desk Accessories to copy information between applications, Control Manager to individualize Windows and Print Manager to control printing.

   A. The level of understanding the course gave me for this objective was...
   B. The importance of this objective to performing my job is...
   C. The confidence I have in my ability to apply this objective to my job is...

3. OBJECTIVE: Use the mouse to operate Windows applications.

   A. The level of understanding the course gave me for this objective was...
   B. The importance of this objective to performing my job is...
   C. The confidence I have in my ability to apply this objective to my job is...

4. OVERALL COURSE OBJECTIVE: Introduce the commonly used Windows applications, including the standard approach to icons and menu organization.

   A. The level of understanding the course gave me for this objective was...
   B. The importance of this objective to performing my job is...
   C. The confidence I have in my ability to apply this objective to my job is...

5. For the OVERALL COURSE, indicate the most appropriate numbered response level for each item.

   A. The use of examples relating to my job was...
   B. My opportunities for discussion were...
   C. My opportunities for practice were...
   D. My satisfaction with the instructional methods was...

Windows 3.1 Page 3 of 6
### APPLICATION TO THE JOB

6. **Respond by selecting either item A or B, but not both.** Select the most appropriate type and level of influence that your immediate supervisor has had on your application of the course content to your job.

<table>
<thead>
<tr>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>Neutral</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

**OR**

A. The level of ENCOURAGEMENT from my immediate supervisor was...

Please comment if significant: _____________________________________________________________

7. **Respond by selecting either item A or B, but not both.** Select the most appropriate type and level of influence that your immediate peers have had on your application of the course content to your job.

<table>
<thead>
<tr>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>Neutral</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

**OR**

B. The level of DISCOURAGEMENT from my immediate peers was. .....

Please comment if significant: _____________________________________________________________

8. Please rate the level each of the following potential barriers hinders you from applying what you have learned from the course to your job. Circle 0 if an item doesn’t apply.

<table>
<thead>
<tr>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

**Staffing Needed to Support Your Use**

**Equipment**

**Workspace available**

**Tools**

**Physical Ability**

**Budget**

**Time**

**Job Reassignment**

**Other (please describe below)**
9. **Respond by selecting either item A or B, but not both.** Select the most appropriate direction and level that your work productivity has changed due to your application of the course content to your job.

<table>
<thead>
<tr>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A. The level that my productivity has **INCREASED** due to the course is... 5 4 3 2 1 0

OR

B. The level that my productivity has **DECREASED** due to the course is... 5 4 3 2 1 0

Please comment if significant: _____________________________________________________________

10. **Respond by selecting either item A or B, but not both.** Select the most appropriate direction and level that your work quality has changed due to your application of the course content to your job.

<table>
<thead>
<tr>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A. The level that my quality has **INCREASED** due to the course is........... 5 4 3 2 1 0

OR

B. The level that my quality has **DECREASED** due to the course is........... 5 4 3 2 1 0

Please comment if significant: _______________________________________________.

11. Please circle the group that estimates the percentage of time in a typical week that you could have applied the course content to your job.

<table>
<thead>
<tr>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%-81%</td>
<td>80%-61%</td>
<td>60%-41%</td>
<td>40%-21%</td>
</tr>
</tbody>
</table>

12. Please circle the group that estimates the percentage of the time circled in question 11 that you actually have applied the course content to your job.

<table>
<thead>
<tr>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%-81%</td>
<td>80%-61%</td>
<td>60%-41%</td>
<td>40%-21%</td>
</tr>
</tbody>
</table>

A. After completing the course: 100%-81% 80%-61% 60%-41% 40%-21% 20%-1% 0%

B. Before attending the course: 100%-81% 80%-61% 60%-41% 40%-21% 20%-1% 0%

(You may or may not have been applying some of the content before taking the course.)

13. My level of satisfaction with how well the overall course met my related job needs is:

<table>
<thead>
<tr>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 4 3 2 1 0</td>
<td>5 4 3 2 1 0</td>
<td>5 4 3 2 1 0</td>
<td>5 4 3 2 1 0</td>
</tr>
</tbody>
</table>

---

Windows 3.1 Page 5 of 6
**CUSTOMER RECOMMENDATIONS/COURSE IMPACT**

14. Please list at least one content area that should have been included in this course that would have significantly improved your job performance. Please explain.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

15. Can you recommend at least one additional change to significantly improve the course? Please explain.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

16. Please identify at least one significant change to either you or your immediate supervised work unit from applying the course content. Please explain.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

**OTHER COMMENTS:**

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
APPENDIX B: COURSE OBJECTIVES FOR WORD

COURSE OBJECTIVES/INSTRUCTION

Directions: Please circle the numbered level that is the most appropriate response for each item. Throughout the survey, the scale is Low (1), Medium-Low (2), Medium (3), Medium-High (4) and High (5).

1. OBJECTIVE: Format both the document (margins, tabs, line spacing) and text (center, underline, indent, bold, fonts, borders, shading).

<table>
<thead>
<tr>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

   A. The level of understanding the course gave me for this objective was...
   B. The importance of this objective to performing my job is...
   C. The confidence I have in my ability to apply this objective to my job is...

2. OBJECTIVE: Edit text using Search and Replace and Spell Check functions as well as inserting, deleting, copying and moving blocks of text.

<table>
<thead>
<tr>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

   A. The level of understanding the course gave me for this objective was...
   B. The importance of this objective to performing my job is...
   C. The confidence I have in my ability to apply this objective to my job is...

3. OBJECTIVE: Open, save and print documents.

<table>
<thead>
<tr>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

   A. The level of understanding the course gave me for this objective was...
   B. The importance of this objective to performing my job is...
   C. The confidence I have in my ability to apply this objective to my job is...

4. OVERALL COURSE OBJECTIVE: Prepare original correspondence, memos and other business documents and modify frequently used forms and reports.

<table>
<thead>
<tr>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

   A. The level of understanding the course gave me for this objective was...
   B. The importance of this objective to performing my job is...
   C. The confidence I have in my ability to apply this objective to my job is...

5. For the OVERALL COURSE, indicate the most appropriate numbered response level for each item.

<table>
<thead>
<tr>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

   A. The use of examples relating to my job was...
   B. My opportunities for discussion were...
   C. My opportunities for practice were...
   D. My satisfaction with the instructional methods was...
### APPENDIX C: COURSE OBJECTIVES FOR EXCEL

#### COURSE OBJECTIVES/INSTRUCTION

Directions: Please circle the numbered level that is the most appropriate response for each item. Throughout the survey, the scale is Low (1), Medium-Low (2), Medium (3), Medium-High (4) and High (5).

1. **OBJECTIVE:** Enter data and create absolute and relative cell references; construct formulas and functions by typing, pointing and using AutoSum and Paste Function commands.

<table>
<thead>
<tr>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

   A. The level of understanding the course gave me for this objective was 5 4 3 2 1 0

   B. The importance of this objective to performing my job is 5 4 3 2 1 0

   C. The confidence I have in my ability to apply this objective to my job is 5 4 3 2 1 0

2. **OBJECTIVE:** Use AutoFormat to insert, delete and change the size of columns and rows; use the Standard Toolbar and menu commands to format numbers, fonts, cell alignments, borders and patterns.

<table>
<thead>
<tr>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

   A. The level of understanding the course gave me for this objective was 5 4 3 2 1 0

   B. The importance of this objective to performing my job is 5 4 3 2 1 0

   C. The confidence I have in my ability to apply this objective to my job is 5 4 3 2 1 0

3. **OBJECTIVE:** Preview and print entire and partial worksheets with new margins, headers and footers, gridlines and column headings.

<table>
<thead>
<tr>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

   A. The level of understanding the course gave me for this objective was 5 4 3 2 1 0

   B. The importance of this objective to performing my job is 5 4 3 2 1 0

   C. The confidence I have in my ability to apply this objective to my job is 5 4 3 2 1 0

4. **OVERALL COURSE OBJECTIVE:** Create worksheets containing constants and formulas, modify the contents and appearance of these worksheets and print the results. Emphasize the features of the Toolbar, shortcut menus, AutoFormat, AutoFill, AutoSum, "drag and drop" and Copy, Cut, Clear and Paste.

<table>
<thead>
<tr>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

   A. The level of understanding the course gave me for this objective was 5 4 3 2 1 0

   B. The importance of this objective to performing my job is 5 4 3 2 1 0

   C. The confidence I have in my ability to apply this objective to my job is 5 4 3 2 1 0

5. For the OVERALL COURSE, indicate the most appropriate numbered response level for each item.

<table>
<thead>
<tr>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

   A. The use of examples relating to my job was 5 4 3 2 1 0

   B. My opportunities for discussion were 5 4 3 2 1 0

   C. My opportunities for practice were 5 4 3 2 1 0

   D. My satisfaction with the instructional methods was 5 4 3 2 1 0
VITA

John H. Reed was born in Pittsburgh, Pennsylvania, in 1945. He served in the United States Army from 1966 to 1968 as an avionics instructor, group leader and instructional analyst for the Southeastern Signal School and in the Republic of Vietnam from 1968 to 1969, earning the Army Commendation and Bronze Star medals. He graduated from Lehigh University with a B.A. in English in 1970. He earned an MAT in English from Trenton State College in 1974 and an MBA from Winthrop University in 1980. He has applied to receive his Ph. D. in Vocational Education from Louisiana State University in May, 1996.

After graduating from Lehigh University, he worked in various positions for several major American firms. From 1970 to 1974 he was a department manager for McGraw-Hill. In 1974, he joined Celanese Fibers Marketing Company where he held several analytical and supervisory positions in the Controller's organization. In 1981, John joined Exxon Chemical Company in Baton Rouge, Louisiana. He held positions in computer, financial and operations organizations, including developing and managing computer software training for the Baton Rouge plant. Since 1994, John has been Supervisor of Education And Training for a major petrochemical producer in Baton Rouge.
DOCTORAL EXAMINATION AND DISSERTATION REPORT

Candidate: John H. Reed

Major Field: Vocational Education

Title of Dissertation: Development and Evaluation of an Instrument for Assessing Transfer of Learning to the Workplace

Approved:

Michael J. Burnett
Major Professor and Chairman

Dean of the Graduate School

EXAMINING COMMITTEE:

Betty C. Harrison

Waldine W. Holland

Date of Examination: 12/19/95