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UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

BARRIERS AND FACILITATORS TO PARTICIPATION IN ADULT EDUCATION EXPERIENCED BY INDUSTRIAL WORKERS

A Dissertation

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

Doctor of Philosophy

By

JEAN THORNBRUGH
Norman, Oklahoma
1998

BARRIERS AND FACILITATORS TO PARTICIPATION
IN ADULT EDUCATION
EXPERIENCED BY INDUSTRIAL WORKERS

A Dissertation APPROVED FOR THE
DEPARTMENT OF EDUCATIONAL LEADERSHIP AND POLICIES STUDIES

BY

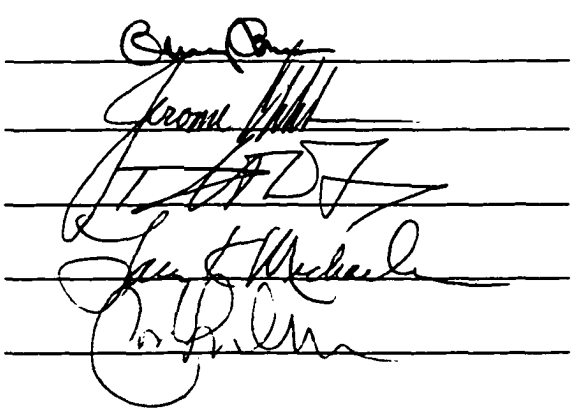

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Table of Contents

Abstract

Barriers and Facilitators to Participation

in Adult Education Experienced by Industrial Workers

By:

Jean Thornbrugh

There is a serious need to understand the effects of barriers and facilitators on patterns of participation in adult education by blue-collar workers. Analysis of these patterns experienced by production and skilled trades workers in an industrial setting can help explain why this very important segment of the U.S. population participates the least.

A survey instrument designed by Alan Hanson and James DeMuth was used to conduct a study on U. S. licensed pharmacists to determine facilitators and barriers to pharmacists' participation in lifelong learning. This same survey instrument was modified and used to identify barriers and facilitators to participation in adult education activities experienced by blue-collar workers.

The survey instrument was administered to a population of 690 production and skilled trades workers at an industrial/manufacturing site; results are based on a 45% return rate (313 responses). A five-point Likert scale was utilized ranging from "never" (1) to "almost always" (5) to examine 16 potential barriers and 12 potential facilitators to participation in adult education activities. The respondents were separated into two groups for testing: (1) the analysis sample (75% of the total respondents) and (2) the "hold-out" sample (25% of the total respondents) for validation purposes.

The greatest barrier experienced by adult education participants was "job constraints" (Mean=3.25) and the greatest barrier experienced by non-participants of adult education was "low priority" (Mean=3.06). The greatest facilitator for participants was "personal desire" (Mean=3.41) and the greatest facilitator for non-participants was "ease of convenience" (Mean=3.14). Simple statistics; chi-square test for independence; correlation statistics; factor analysis; discriminant function analysis; hypotheses testing (using t test) for mean scores; and open-ended question results are reported with other significant findings relative to demographic variables.

Comparisons were made to early studies and specifically to the Hanson & DeMuth study on pharmacists. More than half of the total 28 variables tested indicated a degree of dependence on participation; the factor analysis derived four barrier factors and three facilitators factors from the original 28 variables; the discriminant function analysis identified six variates and produced a prediction accuracy of 79% (validation group) and 78% (analysis group).

Disincentives continue to plague these workers from participating in adult education activities. The costs are high in terms of job, family and time constraints due to overtime and scheduling/shift work and the rewards and recognition for participating in adult education activities are few.

Barriers and Facilitators to Participation in Adult Education Experienced By Industrial Workers

Chapter I

Introduction

Almost one in three adults participated in adult education in 1990-91 ("The Condition of Education, 1993," U.S. Department of Education NCES 93-29). However, those with more education were more likely to participate than those with less education. In an age of rapid technological and economic change, lifelong learning is essential, both for individuals and for society as a whole. Adult education provides a vehicle for the acquisition of new knowledge and the upgrading of worker skills and yet the people who could benefit the most from adult education participate the least.

A. Background

The participation in adult education by occupational category indicates that only 23 to 34 percent of blue-collar workers (precision production, machine operators, assemblers, handlers, etc.) participate as compared to 59 to 64 percent of those in professional, executive, administrative and managerial occupations. Those adults 35 to 44 years old enrolled in higher education more than any other age group (Projection of Education Statistics to 2004, National Center for Education Statistics, U. S. Department of Education, NCES 93-255) and this trend is projected to continue into the 21st century. Although many industrial workers who have held production or skilled trades jobs for many years fall into this age category, they fall behind in returning to the classroom as they face many barriers and obstacles they must overcome in their pursuit of education.

A. Implications

1. Social Concerns

Changing Times

The business community is facing a virtual explosion of new technology, equipment, and machinery. Employees must train, and retrain, in order to maintain a base level of competency to operate these new generations of technology. This challenge confronts the U. S. labor force, employers and society as a whole.

The world is shrinking due to technological communication advances. We must compete in almost every facet of the world economic community. Keeping technological skills competitive requires more diverse and better educational opportunities and learning skills.

In the 1950's and 1960's workers were building and expanding the American Dream. Work was readily available in our industries based on our abundant natural resources. Industry employment required only high school graduation. In many cases, skills and training were handed down from generation to generation within family structures. Many jobs did not require extensive skills, training or education. The work force became lazy. Workers did not typically seek college degrees nor entry into the professions.

During the 1970's, the U. S. was faced with a wave of new technology and competition from all over the world. Our work force was under-educated, under-trained, perceived as unwilling to make needed changes and woefully short of technical skills.

U. S. industrial product quality suffered. Society cried out that our educational system had failed to provide competencies in the three basic 'r's: 'reading, 'riting, and

'rithmetic [sic]. Simultaneously, industry began to employ skilled workers who had good reasoning ability and could solve problems.

During the 1980's U. S. business and industry experienced a profound technological expansion. Powerful computers began handling volumes of information at terrific speeds. As a result, our work force increasingly fell further behind as computer controlled machines began to replace skilled workers. In the early 1990's industry, labor, education, and government leaders began to recognize the problem and started charting a course toward a more competent and better trained work force. Today many skilled workers must be retrained. New people entering the work force must be better educated in order to secure employment. As a result of these technological changes, our employment landscape is littered with lost jobs due to changing technology, outdated facilities, foreign competition, environmental concerns and changing consumer needs.

American Values

People experiencing great change need to be able to fall back on their society's constant belief system which serve as guideposts. Our American industrial value system has guided us through great turmoil and periods of enormous transition in the past and it remains powerful and relevant today. Some of these values, while not solely attributable to American culture, include:

- **Responsibility of workers;**
- **Work** as a source of satisfaction and contribution, not simply as a way to earn a paycheck;
- **Family** as a place to love and be nurtured, learn and teach--a set of connections worth fighting to preserve, not just a place to live;
- **Equality of Opportunity** as a set of expectations and behaviors toward others that infuse our everyday lives--a government socially enforced culture;

- **Commitment** to the next generation as the impetus for doing the work to ensure that our children reach high and achieve as much or more than we do, and;
- **The Common Good** that insists that our identification as Americans takes precedence over narrow ethnic, racial, religious and economic interests (EAE, 1993).

"There is much more to life than earning a living, and we want more from education than productive workers. We want citizens who can discharge the responsibilities that go with living in a democratic society and with becoming parents." Secretary's Commission on Achieving Necessary Skills, U. S. Department of Labor, April, 1992.

America's Changing Families

Single parents, threatening to replace the nuclear family as the norm today head more families. Unmarried teenagers head many of these families while other single parent families are headed by divorced or widowed parents. Almost 85 percent of single-parent families are now headed by women (U. S. Bureau of the Census; *Current Population Reports*, series P-20, no. 468). These single parents must work to support families but often an inadequate education prevents many of them from qualifying for much more than minimum wage jobs. This places many of these families at or below the government welfare poverty level.

Real family income has grown only slightly since 1970. When adjusted for inflation, the median family income in 1970 was equivalent of $32,540 in 1991 dollars. In terms of real purchasing power, the average family is only $3,399 ahead of the average family in 1970 (U. S. Bureau of the Census; *Current Population Reports*, series P-60, no. 180). The virtual non-growth in median family income since 1970 has resulted in a

financial squeeze for many families as health care, housing costs and college tuition and fees have grown faster than income adjusted for inflation. The only feasible option for many adults is to seek to upgrade their skills and compete for higher paying jobs. Adult education can provide the desired new knowledge and the upgrading of worker skills. Ironically, these people who could benefit the most from adult education are participating the least.

Why some adults pursue more learning in formal classroom settings while others do not is an interesting and demanding social question. When coupled with the emphasis on lifelong learning for the continual development of human capital and for an enhanced quality of life, this issue is elevated to an even greater social relevance (Henry & Basile, 1994).

America's Older Adult Population

In 1991, nearly 53 million Americans were 55 years or older. Almost 21 million more adults 55 and older have been added to the census since 1960 (U. S. Bureau of the Census: *Current Population Reports*, series P-25, nos. 917, and 1095). As the "baby boomers" age (generally refers to those Americans born between 1945 and 1960), this population segment is expected to increase rapidly. This growth, the number of workers approaching retirement, profoundly affects every aspect of American society but none more dramatically than the aging worker. As older adults work longer and postpone retirement, adult education will be mandatory to stay abreast of new technologies and assist them in holding their jobs.

2. **Economic Consequences**

Our economy and the world of work are changing rapidly--new technologies,

services, along with jobs and their skill requirements are virtually appearing overnight. "It is also time we changed direction. We must stop thinking of employment and training issues as isolated components of the nation's economic dilemma and come to understand them as part of a comprehensive whole," (Economic Change and The American Workforce Report, U. S. Dept. of Labor, p. 32).

The Secretary's Commission on Achieving Necessary Skills, U.S. Department of Labor, noted in April, 1992:

"...Workplace productivity, however, is the key to national wealth, and earning a decent living is important to most of us...but America no longer leads the world in productivity increases.

"Clearly, all of us--as individuals, communities, employers, and a nation--have reached a point of decision...and we dare not choose badly."

In the "Economic Change and The American Workforce" Research and Evaluation Report by the U. S. Department of Labor Employment and Training Administration (1992) a 'better tomorrow' is discussed:

"These are trying times for the American worker. Foreign competition and wrenching economic change in the 1980's promise to accelerate in the 1990's as Europe prepares to unite, newly industrialized countries continue to advance, and energy costs threaten to rise. Now our resilience is being tested anew. But Americans have always known how to stop, how to change directions, and how to channel their energies into productive new directions. We must do so again," (p. 31).

3. **Human Element and Significance**

Consider the lifelong learning approach: "A system of education that meets the

needs of individuals and workers from cradle to grave, a seamless web from the perspective of the user that allows learners to move in and out easily as their education and training needs change," (Economic Change and The American Workforce Report, U. S. Dept. of Labor, p. 24).

Many industrial workers have not embraced the lifelong learning philosophy for a myriad of reasons and yet it may be the elusive solution to their educational woes. This makes blue-collar workers the most vulnerable population of society to these changes. Barred from the classroom, they become less likely to be able to cope with advancing technological changes. These workers must not be left behind; they must be welcomed into the classroom. They must remain employed rather than displaced and replaced.

4. Summary

The "Training and Employment Report Of the Secretary of Labor," (1995) reports a widening gap in wages between workers with a college degree and those with only a high school diploma. On average, workers with high skill levels earned a weekly wage that was 58 percent higher than workers with lower levels of skills. Because employers are increasingly turning to college graduates in an effort to obtain workers with today's needed skills, the market value of the high school diploma has decreased considerably. This creates a market disequilibrium between supply and demand in which the quantity of workers demanded with advanced technological skills exceeds the supply available. This market disequilibrium results in labor shortages. The greatest consequence of a sustained labor shortage is that the economy will operate at less than maximum efficiency. Thus, workers may have to work more hours per week than they want to, or they may be assigned to jobs they do not want. Existing workers may be used less

efficiently as employers attempt to respond to labor shortages.

Can America's current education and training systems keep pace with our society's rapid technological, economic, and labor market requirements and changes? U. S. society's future social and economic well-being depends on adult educator's ability to meet this challenge ("Beyond the School Doors," U. S. Dept. Of Labor, 1992, p. 1-3).

We must become a nation of learners. In the final analysis, it appears that workers with limited educations endure distractions and disincentives to learning and are experiencing deterrents to participation in adult education opportunities. This dilemma must be regarded as a national priority at all levels of social, economic and human concerns. Critical answers to ensuring individual opportunity, increasing productivity and strengthening the U.S. work force's competitiveness in this global society can be found through advanced research in the area of identification of barriers and facilitators to participation in adult education experienced by blue-collar workers.

I. Purpose of the Study

Embedded in our understanding of the problem, there have been numerous attempts to explain participation in adult education. Some studies have focused on the psychological variables but failed to adequately address the environmental or social context in which the student learning activity occurs. It has been suggested that each of the major types of psychological explanations measures only a fraction of reality. One persistent problem is how to derive a set of behaviors or actions, such as participation, based solely on knowledge of motives and motivational antecedents (Courtney, 1992).

Much is left to be done in terms of constructing a theory to uncover aspects of the 'human condition that affects educational participation,' (Henry & Basile, 1994).

Furst (1986) found that "few inquiries have relied on in-depth interviews for the main evidence." He also indicated his belief that further research in adult education in other settings [emphasis added] is needed. Aslanian (1980) conducted a qualitative study which included both credit and non-credit adult education activities. Henry and Basile (1994) also sampled non-degree and non-credit classes and differentiated between participants and non-participants.

Are we, as Boshier (1989) states, "...still looking for a goodness of fit between people and educational environments," to adequately describe adult education participation?

Previous quantitative studies measuring variables and their inter-relatedness have failed to adequately describe the blue-collar worker population in terms of identifying barriers and facilitators to participation in adult education. Measuring orientation interaction as predictors and boasting of good predictive validity for Boshier's (A-Form) and its psychointerval properties leave something to be desired and, in the instant case, that something is the industrial worker, his/her life experiences, motivations and the importance he/she places on such things.

II Problem Statement

There is a serious need to understand the effects of barriers and facilitators on patterns of participation in adult education by blue-collar workers. Analysis of these patterns experienced by both production [non-skilled labor] and skilled trades workers in an industrial setting can help explain why this very important segment of the U. S. population, who could benefit most from adult education, actually participate the least.

It is imperative, then, to determine whether participation is a function of barriers and facilitators to participation of adult education as described in the review of literature.

An industrial setting study is needed that investigates worker motivation towards education. Explanations of how their life experiences can be interpreted, in terms of barriers and facilitators to worker participation in adult education opportunities, would be useful to educators and industry. A comparison of the findings from this study to earlier studies that have identified barriers and facilitators of different populations will be conducted.

III. Significance of the Study

"Numerous scholars with an interest in participation in adult education have offered models or conceptual frameworks for explaining and predicting participation. Most of these frameworks include social influences and environment as well as individual characteristics and attitudes (Boshier, 1973; Darkenwald & Merriam, 1982) although the "relative weight of these two factors varies from model to model." (Merriam & Caffarella, 1991, p. 243).

"Some researchers, observing that there has been an overemphasis on a psychological reductionist angle (Cookson, 1987; Rubenson, 1982), have had considerable interest in conceptualizing and developing multi-disciplinary orientations to studying adult education participation," (Cookson, 1986; Deshlier & Hagan, 1989).

The proposed research will contribute an additional view of adult education needs to the current knowledge base on deterrents and facilitators to participation in adult

education. "The only way this can be done is by replication of the present research with **different populations** (emphasis added) in North America," (Darkenwald and Valentine 1985).

The strength of this study lies within its value for comparison to earlier studies of different populations in the hopes that the information learned here may be extended to other similar blue-collar worker learning settings.

The results from this study are intended to provide additional information on the barrier and facilitator problems facing working class adult learners returning to classrooms, short courses, video training workshops, on-site and on-the-job training and other advanced non-traditional learning experiences.

This study seeks to understand the perspectives of blue-collar workers and how their human conditions and their working and learning environments define their participation patterns in adult education within their own unique cultural framework. A study of this particular work force population is critical to America's future. The blue-collar work force is the most vulnerable population to the rapid technological and economic changes confronting our society today.

The focus of this research study was to determine what influences the blue-collar worker in an industrial setting in terms of barriers and facilitators to participation in adult education activities.

IV. Definitions of Terms

The following definitions of key words or terms used throughout this study is offered to assist the reader in understanding the usage of the words and terms as they

specifically apply to this study. These "operational" definitions describing precisely how the phenomenon is measured based on the research literature and for the purposes of this study only.

Adult Education: Adult education is a process whereby persons whose major social roles are characteristic of adult status undertake systematic and sustained learning activities for the purpose of bringing about changes in knowledge, attitudes, values, or skills, (Darkenwald & Merriam, 1982).

Barriers: Any obstacle or deterrent that serves as a barricade to the adult learner in the pursuit of educational goals. Any factor (internal, external, mental, emotional, behavioral, social or institutional in nature) that impedes the learner's success in achieving educational goals. These obstacles [barriers] many times present themselves as hurdles or stumbling blocks that deter potential adult learners from further seeking to reach an educational goal or even participate in educational activities.

Discriminant Function Analysis [DFA]: Discriminant function analysis is a statistical computation used to determine which variables discriminate between two or more naturally occurring groups. DFA can also be used to determine which variable(s) are the best predictors.

Education Tuition Assistance Program [ETAP]: This acronym {ETAP} is used in this context to refer to an education tuition assistance program which is a contract-negotiated benefit of all hourly union-represented workers. The existing benefit for the current contract period consists of an annual benefit of $3,800 for college credit courses and of that $3,800, the sum of $2,100 can be used for non-college credit courses for each individual worker.

Facilitators: Any factor (internal, external, mental, emotional, behavioral, social or institutional in nature that aids, supports, helps and/or assists the adult learner in achieving educational goals [derived from the word facilitate: to make easier].

LRC: This acronym is an abbreviation for "**Learning Resource Center**" and refers to the on-site location of an educational facility. This facility is operated by three fulltime instructors [contracted with from a local junior college] who teach computer classes, tutor in basic education courses [i.e., math, spelling, reading, etc.] and act as resources for the hourly workers throughout a 14 hour period. The facility is equipped with many computers, access to the Internet, videos, books, magazines, educational software, CD encyclopedias, and other educational materials which workers may peruse on their own during breaks or before and/or after shift. The workers can attend classes with other workers at appointed times offered before and/or after shifts, or elect to work through self-paced educational materials. Most of these classes offered are at no ETAP cost to the workers; it is paid through a general education fund contracted with the local junior college and the company/union organization. The only exception is that since these instructors are from the "accredited" local junior college, they can offer courses "on-site" for college credit in areas such as: computer software courses, history, government, etc. However, overwhelming, the LRC is used for non-college credit courses and cannot access workers' PDA funds since this is an additional benefit offered at no cost to the employees or their spouses as a contractual benefit.

Non-Participants: Those **workers responding** on the survey that **they had never used their union negotiated educational benefit of tuition assistance**. All union-represented workers in this study have available to them an annual total of $3,800

per year in tuition assistance ($3,800 maximum for college credit courses and of that amount, $2,100 can be used for non-college credit courses). Workers, then, can be categorized as either **participants** (accessing their educational tuition assistance funds) or as **non-participants** (those not accessing their educational tuition assistance funds) based solely on their individual use of the Education Tuition Assistance Program {ETAP}. Due to the ease of accessing these funds, it is doubtful workers would choose to pay for an educational activity from personal funds when this is a negotiated benefit at no cost to the worker. As regards 'ease of accessing the funds,' each manufacturing plant is served by a union-appointed representative, an Education Training Coordinator, who assists the workers in receiving the funds 'up-front' (by paying the tuition directly to the institution) or reimbursing workers who seek funds after enrolling, registering, and pre-paying tuition. It was decided, for the purposes of this study, to differentiate between workers participating in adult education activities **solely** by the use of their educational tuition assistance program.

PDA: This acronym is abbreviated for **Personal Development Activity** and refers to the portion of the educational tuition assistance program dealing with non-college credit courses. These courses range from flower arrangement, sewing, and welding to small engine repair, auto-mechanics, art...and the list goes on. The only stipulation is that the organization offering these classes must be an accredited institution, i.e., North Central Association, which encompasses state votechs and colleges and universities offering non-college credit courses. If a privately owned organization offers a class to the workers, usually on-site, it must have been evaluated by a third accrediting body, i.e., ACE/PONSI, who has observed the instruction, evaluated the teaching

credentials of the instructors and approved of the course objectives and course outcomes, and certified to the company-union that the courses are worthy of being offered on-site for the hourly work force. Consequently these courses are then "approved" for PDA use. The PDA has a ceiling limit of $2,100 per worker annually—this is a portion of the entire $3,800 ETAP fund available for college credit. In other words, a worker may use the entire $3,800 for college credit courses each year—or may elect to use some of the $3,800 for college credit and up to $2,100 for "approved" non-college credit courses. In order to be eligible for the entire $3,800 at least $1,700 must be used for college credit and the balance of $2,100 can be used either for college credit courses or for PDA [approved non-college credit courses].

Participants: Those **workers responding** on the survey that **they had used their** union negotiated educational benefit of **tuition assistance**. Three levels of participants were utilized in this study: (1) Those workers who had used their educational tuition assistance program (ETAP) during the past 12 months; (2) Those workers who had used their ETAP during the past 1 to 5 years; and (3) Those workers who had used their ETAP funds, but had not used them in six or more years. Since all union-represented workers in this study have available to them an annual total of $3,800 per year in tuition assistance ($3,800 maximum for college credit courses and of that amount, $2,100 can be used for non-college credit courses) it can be assumed that the workers can be categorized as **participants** (accessing their educational tuition assistance funds) or as **non-participants** (those not accessing their educational tuition assistance funds) based **solely** on their individual use of their **ETAP**. Due to the ease of accessing the funds, it is doubtful workers would choose to pay for an educational activity from

personal funds when this is a negotiated benefit at no cost to the worker. As regards 'ease of accessing the funds,' each manufacturing plant, is served by a union-appointed representative, an Education Training Coordinator, who assists the workers in receiving the funds 'up-front' (by paying the tuition directly to the institution) or reimbursing workers who seek funds after enrolling, registering, and pre-paying tuition. It was decided, for the purposes of this study, the "sole" criterion selected to differentiate between participants and non-participants in adult education activities was by the use of their educational tuition assistance program. If workers had accessed ETAP funds, they were designated "participants" and if workers had "never" accessed ETAP funds, they were designated "non-participants.

Worker Status: All workers were divided into three categories for the purposes of this study as:

1. Active worker status present on-site,
2. Workers on **Temporary Layoff** status [**TLO**] and absent from the work-site, or
3. Workers on Medical Leave status and absent from the work-site.

V. Limitations

A primary limitation of this study is the limited number of workers available to be surveyed as subjects. These workers are confined to one particular industry within a major U. S. manufacturing environment and are union-represented workers.

It should be noted that the responses of these subjects may have limited

generalizability to the U. S. sub-population of blue-collar workers at large in that these workers are represented by a major national labor union. Many blue-collar workers in a non-unionized environment may not have a tuition assistance program available to them and, consequently, may experience some differences in the barriers and facilitators of participation to adult education than union-represented workers with an ETAP benefit.

Chapter II

Review of Literature

In recent years much research has been conducted on participation in adult education. Leading researchers have proposed many different models that attempt to describe motivations and deterrents to participation. Profiles of participation have been developed to further seek an understanding of the decision to participate--or not participate--in adult education. Accordingly, a great deal is known about voluntary participation in organized learning activities by adults and about the adults who choose to participate (see Table 1.).

Reasons for and Deterrents to Participation in Adult Education

The seminal study by Houle (1961) to determine motivational factors for adult learning was conducted over 25 years ago, yet it remains an authoritative cornerstone in terms of thinking about the different motives for adult learning (Cross 1984). Houle (1961) is credited with developing this influential motivational study to better explain why some adults were active learners. He classified 22 case studies of active learners into three categories:

Goal oriented learners refer to those who seek to reach specific objectives whereby learning is simply a series of episodes directed to meet an identified need or interest. The episode ends when the learner selects whatever method will best achieve that goal.

Activity oriented learners best describe those who participate merely for the sake of the activity itself rather than to gain information or develop a skill. It is a means to an end and that end might be taking a course merely to escape boredom and loneliness or to remedy other maladies in their lives.

Learning oriented learners were identified by Houle as a group who pursue learning and knowledge for direct benefits as well as for knowledge sake. Surfacing in adult education literature decades later as the 'lifelong learners,' they seem to possess a fundamental desire to seek understanding and develop personal growth through learning.

Although Houle's typology is not the definitive work on adult motivations, Boshier (1976) readily admits that: "...many motives have been generated, (yet) no writer has clearly accepted or refuted the typology." Cross (1984) believes that Houle 's qualitative study heralded the first stage of developing a useful framework for thinking about multiple motives for adult learning.

To further analyze the adult learner, Houle (1964) branched out and studied retention rates. He believed that during the decade of 1954-64 a great deal of serious and productive research had been devoted to the double question: "Who comes to adult educational activities and why?" He stressed the importance of devoting at least some attention to an equally important pair of questions: "Who Stays--and Why?" His research focused on the motivations of the adults present at the beginning of an adult education activity and found that at the conclusion of that activity the population remaining had a markedly different pattern of characteristics. His belief was that until the retention problem was answered, no educational program could become fully effective even if who participates is known and why.

During the early 1960's the need to separate 'motivation to participate' (activity oriented) from the 'motivation to learn' (learning oriented) was recognized (Knox, 1962). Knox noted that the problem of motivation in the learning activity itself was more elusive than the motivation to participate. The motivation to participate was certainly influential

but further research was needed to determine other types of motives that operate in the learning situation.

"The first national study of participation in adult education was conducted by Johnstone and Rivera at the National Opinion Research Center (NORC) in 1965. This was the first of several major national studies which found consistent profiles of the adult participant," (Henry & Basile, 1994). Adult education participants were described as young, better educated, employed full-time with a relatively high income. They were most commonly white, and more often married with children (Johnstone & Rivera, 1965). The study conceptualized adult education around two criteria:

(1) That it be limited to activities in which the main purpose was to acquire knowledge, information, or a skill; and

(2) That the activity be organized around some form of instruction.

Johnstone & Rivera's initial portrait of the average adult education participant has endured, for the most part, throughout early and contemporary studies (Henry & Basile, 1994).

Johnstone (1962) found in an earlier study that level of formal education attained and the educational experiences when the learner was young strongly influenced on rates of future participation. By 1965, Johnstone began to further question, "just what is it about a formal education that so effectively disposed one to return to organized learning experiences in later life."

No one has pursued this topic more vigorously than Roger Boshier. Adult education stressed the importance of developing programs compatible with the needs and motives of participants but Boshier believed an associated aim was the desire to create

learning environments which would be congruent not only with the needs but the expectations and learning styles of adults. He largely focused his research on gathering information concerning participants' motives and consequently developed the Education Participation Scale (EPS) from which he derived a six factor model:

(1) Social contact
(2) **Social stimulation**
(3) **Professional advancement**
(4) **Community service**
(5) **External expectations**, and
(6) **Cognitive interest**.

A factor analysis of the EPS was conducted by Morstain and Smart (1974) to illustrate the types of conclusions derived from not only Boshier's EPS but also from the Reasons for Educational Participation Scale (REPS) (Burgess, 1971) as well (Cross, 1984). These factors were:

Factor I. Social Relationships
1. To fulfill a need for personal associations and friendships
2. To make new friends
3. To meet members of the opposite gender.

Factor II. External Expectations
1. To comply with instructions from someone else
2. To carry out the expectations of someone with formal authority
3. To carry out the recommendation of some authority.

Factor III. Social Welfare
1. To improve my ability to serve mankind
2. To prepare for service to the community
3. To improve my ability to participate in community work.

Factor IV. Professional Advancement
1. To give me higher status in my job
2. To secure professional advancement
3. To keep up with competition.

Factor V. Escape/Stimulation
1. To get relief from boredom
2. To get a break in the routine of home or work
3. To provide a contrast to the rest of my life.

Factor VI. Cognitive Interest
1. To learn just for the sake of learning
2. To seek knowledge for its own sake
3. To satisfy an inquiring mind.

Cross (1984) points out that the Morstain and Smart analysis validated Houle's more subjective observations to some extent. There was, however, an important difference between the two approaches:

- Houle classified **groups of people**, while
- Morstain and Smart identified **clusters of reasons**.

Boshier spent more than two decades analyzing, testing and correlating Houle's typology to his EPS, both by factor and cluster analyses. He differentiated his findings as indicative of **life-chance** (deficiency/characteristic of lower socioeconomic-economic groups) or **life-space** (growth/characteristic of upper socioeconomic-economic groups) motivations. Boshier (1978) conducted a similar study based on 84 older adults retired from the work force who were enrolled in non-credit courses. By the 1980's Boshier directed his attention toward lifelong learning education principles (Boshier, 1980). He

later reported that, "In the future, practitioners and professors who speak of goal activity and learning orientations must realize that this reality is more complicated than Houle envisioned more than 20 years ago," (Boshier, 1985).

Questions subsequently raised were directed at Boshier's model to adequately explain participation (MacLean, 1987). MacLean suggested that "the empirical results, specifically related to the validity of the EPS constructs and the utilization of the Personality and Educational Environmental Scales (PEES) may be suspect and overall raises doubt as to the reliability." Older adults (age 62-85) enrolled in university courses were studied to determine their motivations and reasons for participation (Furst & Steele, 1986). These researchers developed their studies based on their beliefs that Boshier and his associates had largely sampled adults in the 18-55 year age span and had virtually overlooked adult learners 60 and over. They concluded that further adult education research was needed in other settings.

In 1981 (Cross) offered the Chain-of-Response (COR) model to explain relevant learning variables and their interrelationships for the purpose of understanding participation in adult learning activities. While she acknowledged that it was "still far from the kind of theory that can be used to predict who will participate in which adult learning activities," it was useful in organizing existing knowledge. She suggested that this framework should be utilized to more sharply focus on future research projects that would add to the accumulation of learner participation knowledge.

The COR model incorporates these elements:

1. Self-evaluation
2. Attitudes about education
3. Importance of goals and expectation that participation will meet goals
4. Life transitions
5. Opportunities and barriers
6. Accurate information...all leading to
7. Participation.

Regarding the element of **self-evaluation**, Cross indicates that past research has shown that certain relatively stable personality characteristics play an important role in the motivation for achievement. Since formal education is considered achievement motivated (competitive education), research suggests persons who lack confidence in their own abilities avoid putting themselves to the test and are unlikely to volunteer for learning which might present a threat to their sense of self-esteem. Therefore, in the COR model, **self-evaluation** is where the chain of responses leading to participation begins (Cross, 1981-1984).

Attitudes toward education arise directly from the learner's own past experiences and indirectly from the experiences of friends and 'significant others.' In an excerpt from, *Adults as Learners*, it is suggested that the "widespread failure of members of the United Auto Workers to use educational benefits, for example, is frequently attributed to indifferent or negative attitudes toward adult education on the part of fellow workers," (Cross, 1984). In linking **self-evaluation** and **attitudes toward education**, Cross suggests an interaction between these two elements, which are derived primarily from past experience and learning, makes some people eager to seek out new experiences with a potential for growth while others avoid challenges to their accustomed ways of

thinking or behaving. The **importance of goals and expectation that participation will meet goals** is recognizable as the familiar expectancy-valence theory of motivation developed by Tolman, Lewin, Atkinson, Vroom, and more recently, Rubenson. If a goal that is important to a person is likely to be achieved through further education, then the motivation is strong. If the goal is not especially important or the likelihood of success is in doubt, motivation decreases accordingly. Expectancy is related to self-esteem where individuals with high self-esteem 'expect' to be successful and those with less self-confidence entertain doubts about their probable success. **Life transitions**, periods of change calling for adjustment to new phases of the life cycle, may 'trigger' a latent desire for education into action. Once individuals are motivated to participate in some form of learning activity, **barriers and special opportunities for adult learning** come into play. If adults get to this point in the COR model with a strong desire to participate, it is likely that the force of their motivation will encourage them to seek out special opportunities and to overcome modest barriers.

However, the reverse is also true: for the weakly motivated, modest barriers may preclude participation. **Accurate information** plays a critical role in the COR model in that it provides the information that links motivated learners to appropriate opportunities. Without accurate information the model is weak because opportunities are lost and barriers loom large. Thus, the COR model can be used to explain why some adults fail to participate in learning opportunities and used as such can be helpful in organizing thinking and research in this area.

Research, associated with The College Board, was conducted in 1983 to determine why adults returned to school (Aslanian, 1989). This study further explored

why adults choose certain topics and considered the triggering events in life that converts the latent learner to an active learner at the on-set of learning.

Conclusions reached in this study:

1. We have, indeed, become a learning society; half of the adults and all of the children in the nation are learning.
2. Adults are learning in a number of different settings, some of them surprising; 60 percent of the adults we studied were learning in non-educational institutions—half of those on their own.
3. Everybody who learns to meet a life change can identify a trigger event.
4. Learning is distributed unevenly in the several life areas, with career being the most heavily weighted.
5. Over half of the adults we surveyed were learning two or more topics simultaneously. Once we have reached them, they will often stay with us. People who have learned in the past are the best prospects for adult learning in the future.

Another study was designed specifically to consider the decision to participate "in formal education," (Henry & Basile, 1994). They attempted to test the relative strength of these factors:

(1) **Reasons for participation**, and

(2) **Deterrents to participation.**

The factors believed to be affecting the decision to enroll in formal adult education in this study include:

Target Population:	**Reason for Enrolling:**
• age • gender • race • education • occupation • employment status • income • family characteristics • marital status • residence	• general interest • job related • meet new people • hobby • major life changes in the last year
Sources of Information:	**Course Attributes:**
• Mailed brochure • Newspaper • Radio • Television • Friend • co-worker • supervisor	• type of course • length of course period • number of course meetings • instructor • number of locations course is offered • course time • course content
Deterrents	**Institutional Reputation:**
• distance to class/travel time • mass transit services • parking • spare time • method of registration • child care • course fees	• attitude toward program • image of program • impression of institution/college • experience with program

Although significant research has been accomplished to determine the motives for participation, theorists differ on which are the major factors:

- A National Center for Education Statistics (NCES) study completed in 1984 identified the single most important reason for enrollment was to secure a new job or to advance in a job.
- Boshier, for the most part would agree that job related reasons 'head the list,' although by 1977, he added the social context of "meeting new people or

to begin a new hobby."

- Aslanian and Brickell (1980) believe that major life changes is what catapults adults into learning activities, while
- Henry and Basile (1994) found work-related reasons overall were the strongest motivators of interest in a course.

Another conceptual framework to explain participation might look something like this:

Antecedent Variables:
Independent Variables:

* Previous education experience
* Social Economic Status
* Family held value of education and level of education attained by family members

Leading to Motivation
* Positive effects
* Negative effects

Intervening Variables:
* Facilitators [things that make it easier to pursue education]
* Barriers [obstacles that make it difficult to pursue education]

Outcome:

Participation
Dependent Variable
* Based on the cumulative effect of the facilitators and barriers.

Research was also conducted to determine deterrents to participation as cited by Kerka (1986); Scanian (1986); Benshoff and Lewis (1992); Bauer and Mott (1990); and Terrell, 1990 including these categories:

- Cost Concerns
- Questionable worth, relevance, or quality of available educational opportunities
- Negative perceptions of the value of education in general
- Lack of motivation or indifference toward learning
- Lack of self-confidence in one's abilities
- A general tendency toward non-affiliation
- Incompatibilities of time and/or place
- Feeling guilty about not 'being there' for their children
- Concerns about quality and expense of child care
- Making compromises in careers due to family considerations
- Minimal individual free time
- Perceived lack of credibility when returning to college, and
- Insufficient support from family for returning to school.

Major research was further accomplished in this area, originally by Scanlon and Darkenwald (1984), followed by Darkenwald and Valentine (1985) and Darkenwald and Hayes (1990). An instrument, the Deterrents to Participation Scale (DPS) was developed by Scanlon and Darkenwald (1984) wherein six factors were identified and summarized for health professionals as

• Lack of Confidence	• Lack of Course Relevance
• Time Constraints	• Lower Personal Priority
• Cost	• Personal Problems

A modified version of the DPS, the DPS-G, was designed specifically for the general public in hopes that results could be generalized and thereby contributing significantly to the development of a general theory of participation. The results from the DPS-G did, indeed, differ significantly from the DPS study populations (health-related continuing professional education vs. the general adult population). **The differing findings of the two studies suggest that modified** or specially developed DPS

instruments are needed to measure deterrents for distinctive sub-populations.

Another instrument was developed by Darkenwald & Hayes (1988) the *Adult Attitudes Toward Continuing Education Scale (AACES)* in an effort to measure the attitude construct present in participation behavior in adult education. **The AACES provided the basis for further exploration of differences in attitudes among subgroups of the adult population**. Findings suggested that overall attitudes and motivation toward adult education participation varied significantly among men and women, individuals with different levels of educational attainment, and adults with different levels of income. Factors identified were:

Enjoyment of Learning Activities
Importance of Adult Education, and
Intrinsic Value of Adult Education

These researchers found that "...For enhanced understanding, a more helpful approach is to group people initially according to the variable in question, ...and then to describe the groups according to a variety of personal characteristics, including the extent of participation in adult education," (Hayes and Darkenwald, 1990).

Building on this research, Valentine and Darkenwald (1990) further sought to identify and describe distinctive types of adults "...in an attempt to understand, not the basic forces that hinder participation, but the extent to which different types of potential learners experience these forces," (Valentine and Darkenwald, 1990). The purpose of this study was "...(a) to divide the research population into distinct subgroups, or clusters, of adults based on observed patterns of perceived deterrents to participation and (b) to

describe the identified subgroups in terms of available socio-demographic variables." (Valentine and Darkenwald, 1990). They **concluded "...Only by studying the ways in which deterrents manifest themselves in different populations can we ever hope to achieve a general theory," (Valentine and Darkenwald, 1990)**. They further stated that other **variables worthy of consideration for future research included marital status, number of dependent children and occupation** which would enable researchers in the field to better develop sophisticated and theoretically useful deterrent profiles of potential learners.

Early Participation in Adult Education Studies
And Applicable Motivational Studies

Research methods for seeking motivation of adult learners fall into four categories:

1. In-depth interviews (to describe types of learners)
2. Statistical analysis of motivational scales (to identify clusters of learning motives)
3. Survey questionnaires (to identify the learning needs of subgroups in the population), and
4. Hypotheses testing (to search for explanations).

The following table summarizes significant early studies in adult education, applicable motivational studies and tests of relative strength of participation factors:

Table 1. Measurement of Constructs

Constructs	Year	Major Researchers and How Constructs were Derived:
Motivation	1954	Maslow – Hierarchy of Needs – Based upon higher motivation on the lower levels of human needs (i.e.. basic needs [security/safety]). then once those needs are satisfied. humans look to satisfy the high levels (esteem. recognition. self-actualization).
Expectancy –Valence Theory	1932. 1938. 1964. 1977	Tolman (These researchers based their studies on the theory that people exper- Lewin (ience felt needs. perceive through factors in the environment that if Vroom (they exert behavior. they are apt to reap certain desirable consequences. McClelland & Atkinson (and that they will place a value on reaping these Rubenson (rewards. thus motivating them towards the behavior.)
Force Field Analysis	1967	Miller – explained why socioeconomic status (SES) and participation in adult education are related through the presence of positive and negative forces (related to Maslow's needs hierarchy and Lewin's concept of positive and negative forces which when combined form a resultant motivational force.
Intrinsic Motivation. Goal Expectancy and Expectancy-Valence Theories	1961	Houle Cognitive Interest explored (Learning Oriented Learners) Goal Oriented Learners and Activity Oriented Learners Classified groups of people – conducted in-depth interviews.
Motivation for learning is a function of the interaction between internal psychological factors and external variables	1971. 1972 and 1973	Boshier – Adult education participation can be explained by the magnitude of the discrepancy between participant's self-concept and key aspects of the educational environment. "Congruency Model." . He designed and administered the 'Education Participation Scale (EPS)" finding certain significant elements: social status: social stimulation: professional advancement: community service: external expectations: and cognitive interest.
Seven Motional Factors	1971	Burgess – He hypothesized eight preliminary motivation clusters. designed a survey using seventy items representative of the eight clusters: "REPS"—Reasons for Education Participation Scale
Factor Analysis of EPS	1974	Morstain & Smart – found six significant factors at work to describe participation: (I) Social Relationship: (II) External Expectations: (III) Social Welfare: (IV) Professional Advancement: (V) Escape/Stimulation: and (VI) Cognitive Interest
Reasons for Learning	1974	Carp. Peterson. and Roelfs – participated in the Commission on Non-traditional Study (CNS) national survey using the motivational factors derived by Burgess (1971)
Chain of Response Model	1981	Cross – Conceptual framework designed to identify the relevant variables and hypothesize their interrelationships. Seven variables were identified: (1) Self-evaluation: (2) Attitudes about education: (3) Importance of Goals & Expectations that participation will meet goals: (4) Life Transitions: (5) Opportunities and Barriers: (6) Information: and (7) Participation.

Table 2. More Recent Tests of Relative Strength of Participation Factors

Tests	Year	Major Researchers and Test Measures
Deterrents to Participation Scale (DPS) and Later. (DPS-G)	1984. and 1989	Scanlon & Darkenwald: Identified these factors: (1) Lack of confidence: (2)Lack of Course Relevance: (3) Time constraints: (4) Lower personal priority: (5) Cost: and (6) Personal problems as most significant deterrents to participation.
Deterrents to Participation Scale Questionnaire (DPS-Q)	1985	Darkenwald & Valentine: Validated DPS-Q
Adult Attitudes Toward Continuing Education (AACES)	1988	Darkenwald & Hayes: Identified these factors as principal reasons for participation: (1) Enjoyment of learning activities: (2) Importance of Adult Education and (3) Intrinsic value of Adult Education

In 1991 a study was conducted to measure the barriers and facilitators to participation in lifelong learning by pharmacists in a nation-wide survey of all registered U.S. pharmacists (Hanson and DeMuth, 1991). Sixteen potential barriers and twelve facilitators to lifelong learning participation were examined.

Perceived barriers included:

• Lack of confidence	• Job constraints
• Low personal priority	• Lack of information about available learning opportunities
• Family constraints, and Scheduling	• Negative experience with prior learning at college level
• Negative experience with prior CE learning	• Professional burnout
• Lack of recognition	• Lack of learning opportunities to match learning style
• Low personal priority, and • Lack of relevance	
• Negative experience with prior learning (K-12 level) • Cost	
• Lack of quality • Lack of career advancement resulting from participation	

Perceived facilitators to learning included:

• Personal desire to learn	• Enjoyment/relaxation
• Opportunity to meet/interact with others	• Requirement for professional licensure
• Encouragement through employer or organization	• Encouragement through family
• Opportunity to increase recognition	• Fear of obsolescence
• Affordable learning opportunities	• Ease of access to learning opportunities

The focus of their study was to determine which factors served as barriers and/or facilitators for pharmacists in the pursuit of life long learning objectives. The researchers further analyzed the perceived barriers and facilitators with respect to demographic information collected on the study sample rendering four demographic variables:

Employment	Age	Setting	Position

Their study identified the greatest barrier for pharmacists was (1) job constraints (mean = 4.3) followed by (2) scheduling; (3) family constraints; and (4) lack of relevance.

The best facilitator was identified as (1) personal desire to learn/intellectual curiosity followed by (2) requirement for licensure; (3) enjoyment/relaxation; and (4) opportunity to interact. The median age in years fell into the 30-39% range and 88% of the responding pharmacists held B.S./B.A. degrees. An over-whelming 90% of the pharmacists responding are affected by licensure requirements mandating participation in continuing education.

While this research provided a research model of barriers and facilitators to continuing higher education participation by pharmacists, **it fails to generalize to the general public or other special populations.** Industrial blue-collar workers are one such special population who may experience different barriers than other lifelong learners. Their barriers may require specific facilitators that are unique to their socio-economic cultural group and work setting.

The pharmacy research model survey instrument was modified for use with other special populations. In the present study the pharmacy instrument was modified for use

in studying the barriers and facilitators to participation in adult education activities by blue-collar workers in an industrial environment. Information derived from this study is needed to help blue-collar workers and similar sub-population groups overcome perceived barriers and promote their identified facilitators to participation in adult education.

The focus of this research study was to determine what influences the blue-collar worker in an industrial setting in terms of barriers and facilitators to participation in adult education activities.

The following information provides the questions used in the Hanson & DeMuth survey instrument (modified for the instant study) and offers the reader a basis for the formulation of the hypotheses posited in the instant study section which follows in Chapter III Methodology:

Survey Question No.	Demographics
1	• Gender
2	• Age
3	• Level of Education Achieved
4	• Production worker or Skilled Trades
5	• Years in current job/classification
5a	• Current classification
6	• Hours of overtime worked per week
7	• Marital status
8	• Spouse's highest level of education attained
9	• Spouse's category of employment
10	• Number of dependent children
11	• Usage of tuition assistance program (**ETAP**)
12	• Current work status: active, TLO, or
13	• Building Location: Float or FAB
14	• Weekly work schedule: 5 day or 7 day
15	• Current Shift: Shift 1, 2, or 3

Survey Question No.	Barriers to Learning
16	Lack of Confidence (for example, fear of something new, doubts regarding the ability to learn, expected difficulty of learning encounter, etc.
17	Lack of Interest in learning opportunities known to be available.
18	Job constraints (lack of relief help, time off, shift work, overtime)
19	Low personal priority of learning in relation to other activities
20	Cost of participation in learning
21	Family constraints (for example, spouse, children, personal)
22	Negative experience with prior learning in grade school or high school
23	Scheduling (location/distance/time) of group learning activities
24	Negative experience with prior learning at the votech/college level
25	Lack of available or desired courses
26	Negative prior learning experience at the Learning Resource Center
27	Job-related burnout
28	Learning activities don't result in job advancement opportunities
29	Lack of learning opportunities to match your learning style
30	Lack of recognition for participating in learning activities
31	Lack of information about available learning opportunities

Survey Question No.	Facilitators to Learning
32	Personal desire to learn (for example, intellectual interest)
33	Enjoyment/relaxation provided by learning as a change of pace from the "routine"
34	Opportunity to meet/interact/exchange ideas with others
35	Requirement for maintenance of professional licensure or technical skills
36	Encouragement from an external source (for example, employer)
37	Encouragement from family
38	Opportunity to increase recognition from and ability to serve community
39	Job advancement with potential for better income
40	Ease of convenience to learning opportunities
41	Fear of obsolescence, keeping up with technology
42	Affordable learning opportunities/financial assistance
43	Assistance of an on-site counselor to offer advice relative to learning opportunities/issues/problems

Additionally, the modified Hanson-DeMuth instrument used in the instant study contained open-ended questions that allowed workers to describe in their own words:

1. The greatest obstacles they faced that kept them from going back-to-school,
2. What would make it easier for the worker to go back-to-school,
3. How long it had been since the worker attended school,
4. What would motivate the worker the most to 'go back-to-school,' and
5. Had the worker made recent plans to take any classes, seminars or workshops.

Chapter III

Methodology

Introduction

The purpose of this study was to determine significant barriers and facilitators that affect individual worker's participation in adult education. It is imperative, then, to determine whether participation is a function of barriers and facilitators to participation of adult education as described in the review of literature.

Boshier's Educational Participation Scale (EPS) has been found a reliable instrument to measure motivation and characteristics of participants in continuing education. Motivation, however, addresses only one piece of the puzzle. Darkenwald, Kerka, Henry & Basile were among the forerunners who focused on the need to identify the barriers, in terms of deterrents to participation, and sought not to identify only the motivating factors (facilitators). Barriers are inclusive of both internal and external obstacles--those deterrents that keep adult learners from entering the classroom.

Hanson and DeMuth, building on the research of their predecessors in the field, designed a study to determine barriers and facilitators involving pharmacists' participation in terms of their lifelong learning philosophy. Their study results provided a description of pharmacists and their role as lifelong learners based on the pharmacists' perceptions. Conclusions were drawn from the pharmacists rankings accomplished through a seven-point Likert scale ranging from "never" (1) to "always" (7) for both facilitator and barrier questions. This study explored an additional dimension through the use of a nine-point Likert scale allowing respondents to rank order their participation in different types of learning activities differentiating between professional pharmacy

learning activities and leisure time learning activities including hobbies, religious, civic or recreational experiences (see Appendix).

Hanson and Demuth's survey was developed from the literature references cited previously and served as the basis for the authors' survey instrument.

This instrument was validated by a group selected from 126 Wisconsin pharmacists who volunteered to participate in response to a random invitation sent to a one in six sample of pharmacists licensed and residing in Wisconsin (N=603). These volunteers were stratified based on four practice settings as well as five categories based on the number of years they had practiced pharmacy. The survey instrument was then mailed to a total of 35 pharmacists with a request to complete the survey, indicate time necessary for completion, comment on readability of the instrument and offer suggestions for additions and/or deletions to the instrument.

This study used a modified version of the pharmacists study survey instrument in a similar study of a different population, namely, industrial workers.

Hypotheses:

The focus of this research study was to determine what influences the blue-collar worker in an industrial setting in terms of barriers and facilitators to participation in adult education activities. It is imperative, then, to determine if participation is a function of barriers and facilitators to participation in adult education as described in the review of literature.

The use of the "working" hypotheses in this study was used simply to suggest where to search most profitably for facts and how to detect relevant relationships between them. It is like examining a condition that exists, combining it with observed facts and an

existing body of theory to form a reasonable explanation for the condition. Consequently, the use of "working" hypotheses in a research study is a speculation—an educated guess—about how two or more variables are related to each other. Formulating hypotheses is the first step in a research study which make specific predictions before data collection. The following hypotheses are grounded in theory and previous research where noted below and are based on particular measurements:

Hypothesis $_0$[1] There is **no significant difference** between participants and non-participants of adult education activities with regard to mean scores in the Facilitators to Learning section of the survey in the areas of:

Facilitators	Survey Question	Research Bases
Cognitive interest	#32	Boshier/EPS; Burgess/REPS; Morstain & Smart/Factors
Escape/stimulation	#33	
Social relationships	#34	
External expectations	#36 & #37	
Social welfare	#38	

Hypothesis $_A$[1] There is a **significant difference** (at the .05 level) between participants and non-participants of adult education activities with regard to mean scores in the Facilitators to Learning section of the survey in the areas of:

Facilitators	Survey Question	Research Bases
Cognitive interest	#32	Boshier/EPS; Burgess/REPS; Morstain & Smart/Factors
Escape/stimulation	#33	
Social relationships	#34	
External expectations	#36 & #37	
Social welfare	#38	

Hypothesis$_0$[2] There **is no significant difference** between participants and non-participants of adult education activities with regard to mean scores in the Barriers to Learning section of the survey in the areas of:

Barriers	Survey Question	Research Basis
Attitudes about education	#22,#24,#26	Cross/COR Model
Lack of information	#31	

Hypothesis$_A$[2] There **is a significant difference** (at the .05 level) between participants and non-participants of adult education activities with regard to mean scores in the Barriers to Learning section of the survey in the areas of:

Barriers	Survey Question	Research Basis
Attitudes about education	#22,#24,#26	Cross/COR Model
Lack of information	#31	

Hypothesis$_0$[3] There is **no significant difference** between participants and non-participants of adult education activities with regard to mean scores in the Barriers to Learning section of the survey in the areas of:

Barriers	Survey Question	Research Basis
Lack of confidence	#16	Scanlon & Darkenwald
Lower personal priority	#17 & #19	
Personal problems	#21	

Hypothesis$_A$[3] There is a **significant difference** (at the .05 level) between participants and non-participants of adult education activities with regard to mean scores in the Barriers to Learning section of the survey in the areas of:

Barriers	Survey Question	Research Basis
Lack of confidence	#16	Scanlon & Darkenwald
Lower personal priority	#17 & #19	
Personal problems	#21	

Hypothesis$_0$[4] There is **no significant difference** between participants and non-participants of adult education activities with regard to mean scores in the Barriers to Learning section and in the Facilitators to Learning section of the survey in the areas of:

Barriers	Facilitators	Survey Question
Job & Time/Scheduling Constraints		#18 & #23
Cost of participating in learning		#20
Job related burnout		#27
Learning activities don't result in job advancement opportunities		#28

Research Basis		
Hanson & DeMuth	Job advancement for better income	#39
	Affordable learning opportunities/ Financial Assistance	#42

Hypothesis$_A$[4] There is **a significant difference** (at the .05 level) between participants and non-participants of adult education activities with regard to mean scores in the Barriers to Learning section and in the Facilitators to Learning section of the survey in the areas of:

Barriers	Facilitators	Survey No.
Job & Time/Scheduling Constraints		#18 & #23
Cost of participating in learning		#20
Job related burnout		#27
Learning activities don't result in job advancement opportunities		#28

Research Basis		
Hanson & DeMuth	Job advancement for better income	#39
	Affordable learning opportunities/Financial Assistance	#42

Hypothesis$_0$[5] There is **no significant difference** between participants and non-participants of adult education activities with regard to mean scores in the Facilitators to Learning section of the survey in the area of:

Facilitator	Survey No
On-site Education Advisor	#43

Hypothesis$_A$[5] There is a **significant difference** (at the .05 level) between participants and non-participants of adult education activities with regard to mean scores in the Facilitators to Learning section of the survey in the area of:

Facilitator	Survey No.
On-site Education Advisor	#43

It was the researcher's original suspicion that these barriers/facilitators significantly affected both participants and non-participants alike (regarding survey questions B-18; B-23; B-20; B-27; B-28; F-39; and F-42) by virtue of their labor union's organization and negotiated contract with the company, and that the survey results would not follow the expected results found to be true with other sub-populations as found in the literature review of this study. Therefore, the researcher predicted similar means in the barrier section for the survey questions above noted for both participants and non-participants and similar means in the facilitator section for the survey questions above noted for both participants and non-participants.

Context of the Study

The research setting was an industrial manufacturing plant located in a major city in a Southwestern state where 690 of the 800 employees are blue-collar workers who are classified as either production (non-skilled labor), skilled trades (such as electricians, plumbers/pipe-fitters, millwrights, etc.) or in union elected and appointed positions (such as bargaining committeemen) representing the hourly workforce.

These workers each have $3,800 per person available annually to them in an Education Tuition Assistance Program (ETAP) for college credit. As part of their nationally bargained union contract within the industry, $2,100 of the $3,800 can be used for non-college credit courses.

Because of the nature of its production processes, this manufacturing facility operates 24 hours a day, seven days a week, 365 days of the year with three continuous shifts:

1. A midnight shift [11pm-7am] – Shift 1
2. A day shift [7am-3pm] – Shift 2
3. An afternoon shift [3pm-11pm] – Shift 3.

Work assignments to these shifts are determined primarily through the seniority process. The lowest seniority for workers at this site is approximately 12 - 15years. Many of the workers have been at this location since its inception in 1974 and many transferred from other sites of this manufacturer giving these workers an average of 20+ years of seniority status.

Survey Instrument Modification

The Hanson & DeMuth pharmacy study was conducted, in part, to determine how mandatory continuing education affected their population. This researcher chose to modify their instrument by deleting the sections dealing with the lifelong learning philosophy statements made by pharmacists. No mandatory continuing education exists for the industrial workers at this facility; therefore, the respondents' description of lifelong learning goal statements and types of learning activities was not applicable to this study. The primary purpose of this study was to determine barriers and facilitators that affect individual worker's participation in adult education activities, and therefore the study did not attempt to draw conclusions based on lifelong learning philosophies held by subject workers. The facilitators and barriers measured on the Hanson & DeMuth instrument were grounded in theory from the literature in the field and required only modest changes to appropriately address the areas which were unique to the industrial worker and his work and social environment.

Some additional open-ended questions were added to the modified instrument to

determine:

- The greatest obstacles they had to overcome in pursuing adult education;
- What factors, activities or events would make it easier for them to go back-to-school;
- How long it had been since the worker's last formal educational experience including high school, college, or votech;
- Their greatest motivator in getting them back in school; and
- Future plans to take a votech class, attend a workshop or seminar to learn a new skill or trade (for example, learn new machine skill; learn to operate a computer; take welding short course, etc.

These open-ended questions were included in an attempt to help develop an additional level of understanding and to offer further explanation of these hourly workers' perceptions of the barriers and facilitators to their participation in adult education as non-traditional adult learners. The researcher also included these questions as part of a check of internal validity of the survey instrument.

The survey form was further modified in several ways to make it more readable, "friendly" and for ease in completion for hourly workers. The original study contained a seven-point Likert scale. It was determined that using a five-point Likert scale in this study would be more appropriate for this population and would be likely to result in better survey returns, while still maintaining appropriate levels of statistical response ranges It was determined that any data lost due to reducing the scale to a five point from a seven point scale was weighed and balanced against the appearance of the complexity of the instrument which might deter some subjects from completing the survey. This simplified instrument enhanced it's complexity without significantly affecting the data sought from the subjects and was sufficient from which to draw accurate conclusions.

Survey Method

After considering alternatives the researcher determined that a printed questionnaire, mailed to each worker's residence, was the most appropriate method to gather the data sought in this study. Reasons for this choice of methods include:

(1) Distributing surveys at the employment site did not ensure workers would take the survey home to review and respond.

(2) Workers did not have adequate time during their breaks at work to complete such a detailed survey. Estimated completion times were checked and estimated at 30 – 45 minutes depending on the extent to which subjects completed the open-ended questions.

(3) The industrial setting does not lend itself well to providing an atmosphere free from distracting loud machinery noise needed for workers to concentrate on thoughtfully completing the survey.

(4) At the time the survey was conducted, 15 percent (nearly one-eighth) of the hourly population of 690 were on a temporarily layoff due to a major furnace rebuild and were absent from the industrial site. The best mode of communication, in terms of successfully conducting the survey to the entire subject population, was to mail surveys to their residences.

(5) A telephone survey was deemed inappropriate due to the complexity and length of the survey.

The surveys were mailed to every worker with a cover letter dated June 12, 1997, (see Appendix A) including those on temporary layoff (TLO) and those on medical leave. Anonymity was ensured in that the surveys contained no names or other personal data

that could identify responding subjects. Each survey was assigned a number to mark it's receipt for follow-up mailing; otherwise, there were no identifying marks to indicate to whom the survey had been sent and only the researcher had knowledge of corresponding survey numbers to employee identities. This confidential information was not shared with any other person to preserve strict confidentiality for the respondents. To allow an adequate initial response, the researcher waited approximately 5 weeks before a follow-up letter was sent to workers who had not responded to the initial request. Attempts to encourage worker participation were accomplished by:

(1) Hand-delivering follow-up letters to those workers not on layoff at their work stations;

(1) One-on-one personal discussions about the purpose, objectives and the importance of the survey with individual workers made on-site;

(2) Through the use of articles in union and company newsletters reminding every worker to return surveys either to the LRC on-site or by mailing to the union hall the enclosed self-addressed, stamped envelope which accompanied each survey to all workers and which said self-addressed, stamped envelopes also accompanied the follow-up surveys for the workers who were on TLO or on medical leave status;

(3) Mailed out second reminder letters, dated July 18, 1997 (see Appendix B) with duplicate numbered surveys to those workers on layoff or on medical leaves;

(4) Copies of cover letters with blank surveys (no numbers assigned) were left with company personnel (assigned to meet weekly with workers on TLO

status in order to arrange for their paychecks during layoff period) in the event these workers (absent from the work-site) had misplaced their surveys, failed to return them, or had not received the initial survey in the mail.

(5) Personal pleas for each worker to respond to the survey were made by researcher at union meetings; and

(6) A final plea for survey responses was made to each worker as they filed through the annual education fair held on-site.

The original cover letter, dated June 12, 1997, accompanied questionnaires mailed to each employee seeking their participation in the study. The cover letter explained the reason for and the importance of the survey (see Appendix A). The letter also explained that although the surveys were assigned a number, **each worker's personal identity would be kept strictly confidential** by the researcher and that the number would be used only by the researcher to identify workers who would be sent reminder letters if they had not responded on a timely basis. Each letter's salutation was hand-written by the researcher and signed personally.

The survey instrument with cover letter was pilot-tested in a focus group consisting of a panel of ten workers to determine readability and clarity of the instrument, and the worker's ability to understand questions and respond accurately, as well as to estimate the length of time necessary to complete the instrument. Modifications were made to the instrument based on the input received from the pilot focus group panel of workers.

Letters returned due to incorrect addresses or lack of forwarding information were hand-delivered on-site to workers.

Analysis

The survey results were analyzed by SAS programs through a combination of elementary descriptive, correlation, Chi-square and multivariate statistical methods:

- Measures of central tendency were utilized by calculating the frequency counts, percentage of responses within groups, arithmetic mean, median values and the standard deviation for each of the five-point Likert scale questions in both facilitator and barrier sections of the survey instrument to determine the greatest and least effect on worker participation in adult education. Information gleaned from the demographic section of the survey including the population, frequency counts, percentages and the means and standard deviations were calculated and shown where appropriate.
- Demographic variables were statistically analyzed by a SAS program in conjunction with barriers and facilitators to determine if any significant relationships existed between the barriers and facilitators based on selected variables.
- The Chi-square test for independence in nominal-categorical data was also conducted to evaluate if significant relationships existed between variables.
- Tables of correlations between barriers and barriers; barriers and facilitators; and facilitators and facilitators were developed to determine if significant interactive relationships between variables existed.
- A factor analysis was conducted to condense and summarize the existing information (variables) across a smaller set of new significant inter-related composite dimensions (factors).
- Working hypotheses were analyzed through the use of a "t" test of significance

calculated on the means of selected survey questions to detect any differences that may or may not exist between participant mean scores and non-participant mean scores.

- A discriminant function analysis (DFA) was conducted to determine whether two groups (participants and non-participants) differ with regard to the mean of SAS program selected group of significantly related variables and then to use those variables to predict group membership. The discriminant function signifies which variables (now variates) are the best predictors to discriminate or select for group membership.

  The discriminant function analysis (DFA) was used to determine which variables discriminated between two groups (participants and non-participants). The task at hand was to examine the many measures used in this study to determine the ones that significantly discriminated between groups. The results from utilizing the SAS program DFA statistic was to build a "model" equation of how to best predict to which group a subject belongs.

- Results from the open-ended questions required qualitative research analysis by sorting, coding, summarizing and analyzing the data. Responses were summarized and data analyzed to determine if central themes, certain patterns and/or commonalties existed across the population. The researcher then used the summary results to relate them to the statistical quantitative barrier/facilitator information collected on the survey instrument as well as to the review of literature herein.

  Complete computer print-outs can be found in the Appendices.

Computational Methods:

SAS computer statistical software was used in analyzing the data for this study.

Backward Stepwise Discriminant Analysis (BSDA): BSDA was determined by the statistician to provide the best results. Using BSDA, all variables are included in the model, and then, at each step, the variable that contributes least to the prediction of group membership is eliminated. This method was selected as the best method and most appropriate for use in this study because it rendered the best predictor by significantly reducing the number of variates [loadings] while producing the least amount of mis-classifications in selecting each subject for overall group membership. This method is commonly used in situations where there are a large number of independent variables [28 in this case].

Computationally, a canonical correlation analysis was performed to determine the successive functions and canonical roots whereby the maximum number of functions will be equal to the number of groups minus one, or the number of variables in the analysis, whichever is smaller.

Interpreting the discriminant functions involves getting "*b*" coefficients for each variable in each discriminant (also called canonical) function. The larger the standardized coefficient, the greater is the contribution of the respective variable to the discrimination between groups. However, it must be noted that these coefficients do not select which of the groups the respective functions discriminate. The means for the functions must be evaluated across groups to identify the nature of the discrimination for each discriminant (canonical) function. Plotting individual scores was used to assist the reader in visualizing how the functions discriminate between groups.

The researcher tested only the number of roots (coefficients) that added *significantly* to the discrimination between groups while ignoring the non-significant functions (roots).

The following underlying assumptions are made for the proposed use of DFA:

- Normal distribution (examined by histograms of frequency distributions)
- Homogeneity of variances/co-variances across groups (examined by a scatter-plot matrix)
- Correlations between means and variances inspected for threat to validity of significance tests (examined through the use of descriptive statistics, i.e., means and standard deviations or variances to guard against such a correlation)
- Variables used to discriminate between groups must not be completely redundant. If, upon computations by inverting the variance/covariance matrix of the variables in the model, any one of the variables is completely redundant with the other variables, then the matrix is said to be "*ill-conditioned*" and it cannot be inverted, i.e., if a variable is the sum of three other variables that are also in the model, then the matrix is ill-conditioned. Tolerance value for each variable was constantly checked though the use of the SAS computer program to guard against matrix ill-conditioning.

Validation of Discriminant Results

The researcher chose to employ an additional sample as the "**holdout sample**" to provide assurances that the results met external as well as internal validity as recommended by DFA authors in the literature (Hair, 1995). The process involved developing a discriminant function with the analysis sample and then applying it to the holdout sample after the groups were randomly divided. The justification for dividing the

total sample into two groups is that an upward bias will occur in the prediction accuracy of the discriminant function if the individuals used in developing the classification matrix, or DF model, are the same as those used in computing the function. That is to say the classification accuracy will be higher than is valid for the DF it was used to classify as a separate sample.

The researcher selected a 75-25% split of the total responses whereby 75% of the surveys were used in the DFA sample analysis and 25% of the surveys were randomly selected to create the holdout group.

The Discriminant Function Analysis was selected as being a very useful tool for:

1. Detecting the variables that allow the researcher to discriminate between different (naturally occurring) groups, and
2. Classifying cases into different groups with a better than chance (50/50) accuracy.

DFA is an appropriate statistical technique when the dependent variable is categorical (nominal or non-metric) and the independent variables are metric. This research study meets this requirement as the dependent variables consist of two groups or classifications (participants and non-participants), while barrier and facilitator variable five-point Likert scale responses were metric.

Chapter IV

Data Analysis

Introduction

This chapter contains seven main sections:

Section 1: The overall summary of basic statistics gleaned from the survey questions discussed in terms of frequencies, percentages, population answering each survey question, means and standard deviations. Where appropriate, charts are embedded into the discussions. This information was extrapolated from computer results produced from a SAS computer program; the entire compilation of the computer printouts resulting from the computer analysis are found in the appendices.

Section 2: The Chi-square test for independence in nominal-categorical data;

Section 3: Correlation statistics;

Section 4: Factor analysis statistics;

Section 5: Discriminant function analysis;

Section 6: Hypotheses testing; and

Section 7: Results from the open-ended questions included on the survey instrument.

Section 1:

Simple Statistics

Each survey question was analyzed in terms of the total number responding to this question (N), the frequency count of the different responses to each question, the percentage to the whole (N), followed by the its mean and standard deviation and is displayed in its entirety in Table 1 found in the appendices.

Note that the survey questions numbered D1-15 signify those questions dealing with demographics. Questions B16-31 signify those questions dealing with barriers and questions F32-43 signify those questions dealing with facilitators. In questions D1-15 some of the means and standard deviations are not shown as those calculations were not applicable when dealing with purely categorical data, and are shown as not applicable (N/A). Responses beginning with Survey Question B-16 through Survey Question F-43 are interval responses with the minimum answer = 1.00 and maximum answer = 5.00. Survey Question B-26 is an exception with the maximum answer being 4.00. Table 1 can be found in the Appendix section.

Observations From The Summary Data

Discussion of Summary Demographic Data:

In four instances (D-2; D-5; D-6; and D-10) t-tests were applied to these results and separate tables displaying those results are included into the "Summary of Demographic Data" for each question.

#D-1 Gender. Males overwhelming dominate this work force (88% males and 12% females). This not surprising in a manufacturing (factory) environment. Note the Chi-square section of this Chapter IV (Section (2) where information was developed on this question regarding participation.

#D-2 Age. Of the 310 respondents to this question, the mean age of the workers is 48.2 years, which indicates a relatively older population. For the purposes of this study, the breakdown of <40 years vs. >40 years is used in other statistical analyses found in this chapter.

Variable D-2 (Age)					
Q11		N	Mean	Std. Dev.	Std. Error
1/Participants		240	47.76	7.96	0.51
2/Non-Participants		64	49.32	7.64	0.95
Variances	T	DF		Prob > T	
Unequal	-1.44	102.5		0.15	
Equal	-1.40	302.0		0.15	
For H_0: Variances are equal, F=1.09 DF = (239,63) Prob F = .71					
Conclusion: Mean age of participants and non-participants not significantly different.					

#D-3 Level of education achieved. The highest majority of workers fall into the category of those who have earned high school diplomas.

#D-4 Skilled trades or production workers. This work force is made up of 25% skilled trades and 75% production workers (non-skilled labor). A complete listing of each skilled trade represented in this work force can be found in the Appendix.

#D-5 Years in current job/classification. The mean years of the 300 respondents to this question was 14.3 years. This number refers to the years in their current job classification, not their seniority at the plant or company seniority. This indicates a very stable work force.

Variable D-5 (Years in Current Job Classification)					
Q11		N	Mean	Std. Dev.	Std. Error
1/Participants		232	14.02	7.14	0.46
2/Non-Participants		62	15.09	7.41	0.94
Variances	T	DF		Prob > T	
Unequal	-1.02	93.5		0.30	
Equal	-1.04	292		0.29	
For H_0: Variances are equal, F=1.08 DF = (61,231) Prob F = .68					
Conclusion: Mean years in current job classification by participants and non-participants not significantly different.					

#D-6 Total hours of overtime worked per week. Overtime (O.T.) is a very important factor in this study. It is hypothesized that there is a significant relationship between participation and this proposed barrier. Of the 292 respondents to this question, 35% of

the work force were not working O.T. hours at the time this survey was conducted. However, it must be noted that in this particular industry, the overall workload experienced by the plant is highly dependent on the consumer's desire for new automobiles. That is to say this industry is market driven. When sales of U.S. automobiles are up, the demand is high for new auto parts and O.T. hours are high. This survey was conducted during the summer which is historically a very slow production time. In fact, this manufacturer totally shuts down most of its plants for a two week period during the mid-summer months for plant retooling to gear up for heavy fall sales and demand for the new production year models. Accordingly, since the O.T. question was influenced by the current O.T. demand, it is reasonable to assume that the hours reported in this study indicate the lowest level workers expect to work throughout the year. Even at the time of the survey, 32% of the employees worked up to 10 hours a week in O.T.; 27% were working 11-20 hours O.T. and 6% worked in excess of 24 hours of O.T. each week.

Variable D-6 [Total of weekly overtime hours worked]

Q11	N	Mean	Std. Dev.	Std. Error
1/Participants	225	8.47	8.91	0.59
2/Non-Participants	62	6.22	6.73	0.85

Variances	T	DF	Prob > T
Unequal	2.15	126.3	.03
Equal	1.84	285.0	.06

For H_0: Variances are equal, F=1.76 DF = (22,461) Prob F = .01

Conclusion: Mean total of weekly overtime hours worked by participants and non-participants are significantly different.

#D-7 Marital status. Of the 312 population answering this question, 85% were married. This factor also proved to be significant in the Chi-square section of this Chapter IV (Section 2) relating to participation and marital status. For the purposes of this study a distinction was made between "married" or "other." The "other" category

included single and divorced subjects; no widows or widowers were reported by the respondent population.

#D-8 Highest level of education held by spouse. The 267 married respondents to this question indicated a median response of their spouses having earned a high school diploma.

#D-9 Spouse's employment status. Of the 265 married respondents to this question, 51% reported their spouses were working fulltime—which is factored in this study in terms of family obligations, time constraints and family support given (or the lack thereof) for workers seeking educational activities outside the home.

#D-10 Number of dependent children. Of the 290 respondents who answered this question, 31% reported that they have no dependent children at this time; while 44% have one or two dependent children and 17% have more than two. This survey question was split into two categories: (1) those who have no dependent children, and (2) those who have >=1 dependent child/children.

Variable D-10 [No. of Dependent Children]

Q11	N	Mean	Std. Dev.	Std. Error
1/Participants	226	1.37	1.50	0.09
2/Non-Participants	62	1.24	1.63	0.20

Variances	T	DF	Prob > T
Unequal	.58	91.1	0.56
Equal	.61	286	0.54

For H_0: Variances are equal, F=1.19 DF = (61,225) Prob F = .36

Conclusion: Mean total number of dependent children of participants and non-participants are not significantly different.

#D-11 Use of tuition assistance program (ETAP). The answers to this question are the "determining factor" that identifies participation and non-participation for this study. In other words, this question was compared to all other questions in the survey to determine

whether participation or non-participation (in the workers' use of their ETAP funds) is a function of the listed barriers and facilitators questions. Participation was measured in this question in levels of usage:

1. ETAP funds used during the past 12 months; 13% of those workers responding to this question = P1
2. ETAP funds used during the past 1-5 years; 50% of the respondents = P2
3. ETAP funds used during the past 6+ years; 16% of the respondents = P3
4. Never used their ETAP funds; 21% of the respondents = NP.

For the purposes of this study, respondents were reclassified as either "participants" (by combining all three levels of participation P1 – P3) or "non-participants" (NP). This was done in order to obtain the highest hit-rate for the DFA [to minimize misclassification errors in terms of prediction rates].

#D-12 Current work status. Of the 309 respondents to this question, results indicate 13% were on TLO status when this survey was conducted; 86% were active employees and only 1% were on medical leave. This question is discussed further in terms of participation in Section (2). The question here to study is if workers on TLO (who presumably have more time and fewer job constraints) reflect any difference in participation rates than their counter parts (active employees).

#D-13 Current work site location. This question simply distinguishes between work-site locations. It was added to the survey due to a common complaint that one of the two locations posed a barrier in terms of equal access to visit the LRC during break-times due to the distance from this facility to the LRC. Although the

LRC was purposely built in a central location to the entire plant facility. in terms of ease-of-access, the FAB facility (46% of the workers are located here) is closer than the Float facility (55% of the respondent workers are located at this location) in terms of distance.

#D-14 Current weekly work schedule. This question was asked because of a common complaint that working the 7-day operation (33% of the respondent population) makes seeking educational opportunities much more difficult in terms of changing work schedules than experienced by working the regular 5-day operation (67% of the respondent population).

#D-15 Current shift. This question was added due to the common complaint that workers in the "off-shifts" (Shifts 1/midnights and Shift 3/afternoon or evenings) experienced more difficulty in pursuing educational activities because their off-hours didn't match society's view of the work day and thus became a barrier in terms of educational opportunities available to them. Day-shift workers were presumed to experience a greater opportunity, in terms of number of classes offered during their off-work hours.

Summary of barrier data:

#B-16 Lack of confidence. It appears from 309 respondents to this question that 79% have not experienced this element as a barrier to participation. Mean=1.83; SD=1.06.

#B-17 Lack of interest in learning opportunities. Over half of the respondent population of 311 failed to be seen as a significant barrier. Mean=2.60; SD=1.16.

#B-18 Job constraints (including shift work and O.T.) "Job constraints" was reported to be a significant barrier felt by about 50% of the workers. However, 36% indicated it would not be significant. At the time this study was conducted, 59% of the respondent population was working some O.T. and 62% was working the day shift. These reported percentages correspond to the situation at the time the study was conducted. Mean=3.19; SD=1.39.

#B-19 Low personal priority. "Low personal priority" produced rather mixed results in that of 312 respondents to this question, 44% indicated this element was not a significant barrier while 39% felt it was a significant barrier. Mean=2.87; SD=1.32.

#B-20 Cost of participation in learning. "Cost of participation in learning" was determined as not significant by 68% of 310 responding workers while 27% reported this element as "not applicable." It is this researcher's opinion that this category is naturally high as cost is not seen as a factor with respect to the workers' ETAP benefits. If half of the N/A percentage of 27 were added to the 68% who felt it was not a significant problem, it would indicate 81% of the population either thought it was not a significant barrier or wasn't even applicable in this case. Mean=1.80; SD=1.04.

#B-21 Family constraints. "Family constraints" were perceived as a significant barrier in 45% of 311 respondents while 39% did not see it as a significant barrier. **Note: This question was selected as one of the significant selection variables used in the DFA.** Mean=2.97; SD=1.41.

#B-22 Negative experience K-12. "Negative experiences with prior learning in grade school or high school" reported an overwhelming 72% of the responding population of 312 rejected the notion that this element was not a significant barrier to their participation in adult education while only 7% of the same population felt it did serve as a significant barrier in their lives. **Note: This question was selected as one of the significant selection variables used in the DFA.** Mean=1.80; SD= 1.11.

#B-23 Scheduling (location/distance/time) of group learning activities. "Scheduling of group learning activities" in terms of "location, distance, time" was experienced with mixed results by 49% of 309 respondents reported non-significance while 37% indicated it was a significant barrier. Mean=2.80; SD=1.38.

#B-24 Negative experience votech/college. "Negative experience with prior learning at the votech/college level" produced similar results to Question #B-22 (negative experience with prior learning at the grade school/high school level": 67% of 312 respondents indicated this element was not a significant barrier to their participation with only 4% of the population indicating it was a significant barrier for them. Mean=1.82; SD=1.01.

#B-25 Lack of available or desired courses. "Lack of available or desired courses" reported 58% of the respondent population did not see it as a significant barrier, while 23% did feel it did pose a significant barrier. Mean=2.37; SD=1.22.

#B-26 Negative experience LRC. Of 309 respondents, an overwhelming 73% indicated that this was not a significant barrier to their participation. Only 3% regarded it as a frequent barrier and no respondents reported that it was felt to be a barrier 'almost always.' Mean=1.65; SD=.95.

#B-27 Job-related burnout. "Job-related burnout" could reasonably have been predicted to be a significant barrier coming from members of a mature and stable work force. In fact, of 311 respondents, 57% reported it was not a significant barrier to their participation while 22% responded that it was considered a significant barrier. Mean=2.39; SD=1.27.

#B-28 Learning activities don't result in job advancement. It is this researcher's opinion that due to the fact this work force is a union shop which primarily uses seniority as the basis for job advancement, it is perfectly understandable that 25% of the respondents indicated it was "not applicable"; 36% reported it was a significant barrier; and 39% reported it was not a significant barrier. Mean=2.97; SD=1.44.

#B-29 Lack of learning opportunities matching learning styles. Of 310 respondents, 63% reported it was not a significant barrier and only 13% felt it posed a significant barrier. Mean=2.17; SD=1.11.

#B-30 Lack of recognition for participating in learning activities. The responses indicate that 59% of respondents may be intrinsically motivated, only 8% perceived this element as an important barrier or external motivator, while 34% reported "not-applicable." This level of N/A could be due to the industry's lack of recognition of its work force. Their primary method of rewarding workers is through the use of financial gain (including benefits). **Note: This question**

was selected as a significant selection variable used in the DFA. Mean=2.05; SD=1.14.

#B-31 Lack of information about available learning opportunities. Of 311 respondents reporting, a resounding 71% indicating this element was not a significant barrier to their participation. This response can be translated to mean that a fairly good job of marketing educational opportunities is present here. There was no distinction between on-site marketing techniques and those provided by institutions off-site—but one thing seems clear...the "message is being received." Mean=1.81; SD=1.06.

Rankings of Significant Barriers by Survey Respondents:

#B-18 "Job constraints"	**50% listed as a perceived barrier**
#B-21 "Family constraints"	**45% listed as a perceived barrier**
#B-28 "No job advancement"	**36% listed as a perceived barrier.**

Note: On question B-28, if the high "not applicable" category (25%) were added to the 36% of those who perceive this to be a significant barrier, the total would be 61% of the population believe it is either "not applicable" (due to the primary seniority method of job advancement) or is significant.

Note: Please refer to Section 7 in this chapter, which reports the answers to the open-ended questions provided on the survey instrument where workers described in their own words the obstacles they face and their motivators.

Summary of facilitator data:

#F-32 Personal desire to learn. Of 310 respondents to this question, 51% believe this element to be a significant facilitator while 37% did not feel it was a significant facilitator for them. Mean=3.26; SD=1.32.

#F-33 Learning defined in terms of enjoyment, relaxation; to break-up routine. Of 308 respondents to this question, 41% reported that this element did act as a significant facilitator while 42% reported it did not serve as a significant facilitator for them. **Note: This question was selected as one of the significant selection variables used in the DFA.** Mean=2.95; SD=1.31.

#F-34 Opportunities to interact with others. From 309 respondents, 49% reported this element did not serve as a significant facilitator while 33% reported that it did serve as a significant facilitator. Mean=2.74; SD=1.27.

#F-35 Requirement for professional licensure. Of 307 responses, 45% reported that this element did not serve as a significant facilitator and only 19% reported that it was a significant facilitator for their participation. These results are not surprising when the reader takes into account that skilled trades make-up only 25% of the work force who would be motivated by licensing requirements. Mean=2.50; SD=1.21.

#F-36 Encouragement from employer". Of 310 respondents answering this question, an overwhelming 61% did not feel this was a significant facilitator. This would be an indicator that workers do not feel "encouraged" to participate in adult education by their employer. Mean=2.31; SD=1.27.

#F-37 Encouragement from family. The answers reported indicate mixed results: 46% of 310 responses did not feel this element worked as a significant facilitator for them while 35% indicated it was a significant facilitator in their participation in adult education. **Note: This question was selected as one of the significant selection variables used in the DFA.** Mean=2.82; SD=1.32.

#F-38 Opportunities for recognition by and service to the community. The results reported from 308 respondents indicate over half (55%) of the population was not extrinsically motivated (in terms of recognition) by community works. Mean=2.32; SD=1.14.

#F-39 Job advancement for better income potential. Responses to the "advancement" facilitator revealed mixed results: 48% felt job advancement did not serve as a significant facilitator to their participation in adult education; 26% reported it was a significant facilitator and 27% marked "not applicable" in their situation. The heavy responses in the "not applicable" category may be due to respondents working in a "union shop" whereby seniority is the primarily means for job advancement. If half of the 27% which indicated (N/A) had been added to the 48% answering this element as not a significant facilitator, the result would represent 61% of the population. Mean=2.53; SD=1.39.

#F-40 Ease of convenience in learning opportunities. Of 309 respondents, 47% indicated that indeed this element proved to be a significant facilitator to their participation while 37% reported it did not serve as a significant facilitator. **Note: This question was selected as one of the significant selection variables used in the DFA**. Mean=3.11; SD=1.30.

#F-41 Fear of obsolescence; keeping up with technology. Of 310 respondents, 52% reported this element did not serve as a significant facilitator to their participation while 30% reported that it did serve as a significant facilitator. Mean=2.59; SD=1.45.

#F-42 Affordable learning opportunities/financial aid. This is another example of where perception of reality may have caused mixed results: 43% indicated this element was not a significant facilitator; 19% reported it was "not applicable" and 38% indicated it did serve as a significant facilitator to their participation in adult education. One conclusion, regarding the high number of "not applicable" responses, stems from the reason that tuition assistance is already available to them as part of their educational benefit package. Mean=2.84; SD=1.45.

#F-43 Value of on-site counselor/advisor affecting participation in adult education. Of 306 respondents to this question, half of the population felt that the existence of an on-site educational advisor did serve as a significant facilitator while 37% reported that the on-site educational advisor did not serve as a significant facilitator. The educational counselor/advisor is a support position provided as part of the union-company negotiated educational benefit package who is located on-site during normal week days and at special union meetings and available to all shifts for any special events for ease of communication with workers on-the-floor about educational opportunities and options.

Rankings of Significant Facilitators by Survey Respondents:

#F-32 "Personal desire to learn"	**52% listed as a perceived facilitator**
#F-43 "On-site educational advisor"	**50% listed as a perceived facilitator**
#F-40 "Ease of convenience"	**47% listed as a perceived facilitator.**

Comparative Chart of Ranked Group Means for Participants vs. Non-participants

Barriers/Participants/Mean	
Job Constraints	3.25
Family Constraints	3.05
No Job Advancement	2.99
Low Priority	2.85
Scheduling (dist/loca/time)	2.85
Lack of Interest	2.57
Job-related Burnout	2.41
Lack avail/desired courses	2.37
Lack learning match style	2.17
Lack of Recognition	2.02
Lack of Confidence	1.78
Lack of Information	1.78
Cost of Part. In Learning	1.78
Negative exp/votech/coll.	1.74
Negative experience K-12	1.73
Negative experience LRC	1.60

Barriers/Non-Participants/Mean/		(+/-) M
Low Priority	3.06	+0.21
Job Constraints	2.97	-0.28
No Job Advancement	2.90	-0.09
Lack of Interest	2.75	+0.18
Family Constraints	2.75	-0.30
Scheduling(dist/loca/time)	2.55	-0.30
Lack avail/desired courses	2.41	+0.04
Job-related Burnout	2.39	-0.02
Lack learning match style	2.22	+0.05
Negative exp.votech/coll.	2.14	+0.40
Lack of Recognition	2.14	+0.12
Negative experience K-12	2.08	+0.35
Lack of Confidence	2.06	+0.28
Lack of Information	1.95	+0.17
Cost of Part. In Learning	1.89	+0.11
Negative experience LRC	1.88	+0.28

Facilitators/Participants/Mean	
Personal Desire to Learn	3.41
Assist. On-site Advisor	3.30
Enjoyment/Relaxation	3.09
Ease of Convenience	3.11
Affordable/Financial Aid	2.87
Encouragement/Family	2.80
Opportunity to Interact	2.78
Fear of obsolescence/Tech	2.59
Requirement/Licensure	2.51
Job Advan/Higher Income	2.50
Opport/Recog/Community	2.35
Encouragement/Company	2.30

Facilitators/Non-Participants/Mean		(+/-)M
Ease of Convenience	3.14	+0.03
Asst. On-site Advisor	3.02	-0.28
Encouragement/Family	2.89	+0.09
Affordable/Financial Aid	2.75	-0.12
Personal Desire to Learn	2.71	-0.70
Job Advan/Higher Income	2.70	+0.20
Fear of obsolescence/Tech	2.65	+0.06
Opportunity to Interact	2.58	-0.20
Requirement/Licensure	2.52	+0.01
Enjoyment/Relaxation	2.42	-0.67
Encouragement/Company	2.38	+0.08
Opport/Recog/Community	2.27	-.0.08

Section 2:

Chi-square Test for Independence in Nominal-Categorical Data

Selection of Test:

A SAS computer analysis was run on each variable in this study. The Chi-square test was selected to evaluate whether there is a statistically significant relationship between two nominal-categorical variables. If there were no relationship between the two nominal-categorical variables, the results would be about the same for the test

results. One could say that the one variable was "independent" of the other. The Chi-square test was developed by Karl Pearson in 1900 specifically to test for "no relationship" between two nominal-categorical variables. The Chi-square test is based on the idea of expected values. The idea is to compute what is expected for each frequency under the assumption of independence. A computation is performed to verify how much the expected values differ from the actual observed frequency. Small values of the Pearson chi-square indicate agreement between observed frequency and independence because the expected values are calculated assuming independence. If the Pearson Chi-square is small, you can accept the idea that each category is independent of each other and that no inter-relationship exists.

The validity of the Chi-square is called into question when small frequencies are a problem. In this study, the computer alerted the researcher to the instances where cells contained expected counts of "less than five." When this case arises, it is appropriate to look at another statistic for confirmation of validity. This second analysis utilized the Likelihood Ratio Chi-square (G^2) to confirm significance levels in those instances where Chi-square values were questionable.

The computer performed the statistic functions and produced a "p value" or "probability factor" for each variable. The "null hypotheses" is stated as: "H_0:p is not equal to zero." In this study an alpha rating of 0.05 (95% confidence level) was used to determine significance level (the rate at which or below the H_O would be rejected). Thus, if $p<0.05$, data supports rejecting H_O.

From the computer print-outs (the complete computer generated data for each variable in the survey is reviewed in the Appendix) a Chi-square and G^2 with the

appropriate degrees of freedom are shown along with the calculated value and probability. Data are considered to three significant digits.

Following are the results of all variables tested in relation to survey question number D-11 (levels of participation):

#D-1 (Gender) by #D-11 (participation levels):

H_0 = Gender is independent of level of use/non-use (participation levels).

Stat.	DF	Value	Prob.
Chi-sq	3	7.471	0.05
G^2	3	7.711	0.05

Since the probability value is greater than 0.05, the conclusion is that "gender" and "participation" are dependent; therefore, the data support **rejecting the null hypotheses** at the .05% significance level.

#D-2 (Age) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0**; age and participation are independent at the **.05 level** of significance.

Stat.	DF	Value	Prob.
Chi-sq	1	1.103	0.29
G^2	1	1.169	0.28

#D-3 (Level of worker education) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0**; Level of worker education and participation are independent at the **.05 level** of significance.

Stat.	DF	Value	Prob.
Chi-sq	18	23.043	0.18
G^2	18	25.179	0.12

#D-4 (Skilled and non-skilled labor) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0:** Skill levels of labor classifications and participation are independent at the **.05 level** of significance.

Stat.	DF	Value	Prob.
Chi-sq.	3	0.795	0.85
G^2	3	0.812	0.84

#D-5 (Years in Current Job Classification) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0**: Years in current job classification and participation are independent at the **.05 level** of significance.

Stat.	DF	Value	Prob.
Chi-sq.	87	91.443	0.35
G^2	87	103.514	0.10

#D-6 (Hourly overtime worked weekly) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0**: Hourly overtime worked weekly and participation are independent at the **.05 level** of significance.

Stat.	DF	Value	Prob.
Chi-sq.	48	45.478	0.57
G^2	48	49.166	0.42

#D-7 (Marital Status) by #D-11 (participation levels):

H_0 = Marital status is independent of level of use/non-use (participation levels).

Stat.	DF	Value	Prob.
Chi-sq.	1	3.691	0.05
G^2	1	4.213	0.04

The researcher must conclude that marital status and level of use/non-use (participation levels) are dependent; therefore, the data support **rejecting the null hypothesis** at the **.05 level** of significance.

#D-8 (Spousal level of education) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0;** spousal level of education and participation are independent at the **.05 level** of significance.

Stat.	DF	Value	Prob.
Chi-sq.	18	14.310	0.70
G^2	18	15.056	0.65

#D-9 (Spousal employment status) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0;** spousal employment status and participation are independent at the **.05 level** of significance.

Stat.	DF	Value	Prob.
Chi-sq.	6	5.088	0.53
G^2	6	5.133	0.52

#D-10 (Number of dependent children) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0;** the number of dependent children and participation are independent at the **.05 level** of significance.

Stat.	DF	Value	Prob.
Chi-sq.	1	1.308	0.25
G^2	1	1.293	0.25

#D-11 is perfectly correlated at 1.000 to #D-11 (participation).

#D-12 (Work status) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0;** work status and participation are independent at the **.05 level** of significance.

Stat.	DF	Value	Prob.
Chi-sq.	6	5.872	0.43
G^2	6	7.013	0.32

Note: This item was of particular interest since it was suggested that perhaps if workers were on TLO status, they would have fewer time constraints and job constraints; and, therefore, results would indicate higher levels of participation. This did not appear to be the case.

#D-13 (Building location) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0;** building location and participation are independent at the **.05 level** of significance.

Stat.	DF	Value	Prob.
Chi-sq.	3	5.845	0.11
G_2	3	5.907	0.11

#D-14 (Work Schedule) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0;** work schedule and participation are independent at the **.05 level** of significance.

Stat.	DF	Value	Prob.
Chi-sq.	3	1.287	0.73
G^2	3	1.281	0.73

#D-15 (Shift) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0:** Shift number and participation are independent at the **.05 level** of significance.

Stat.	DF	Value	Prob.
Chi-sq.	6	8.768	0.18
G^2	6	10.414	0.18

#B-16 (Lack of Confidence) by #D-11 (participation levels):

H_0 = Lack of confidence are independent of level of use/non-use (participation levels).

Stat.	DF	Value	Prob.
Chi-sq.	12	20.617	0.05
G^2	12	18.606	0.09

Data does **not** support rejecting H_o for independence. **Failure to reject H_o:** lack of confidence and participation are independent at the .05% level of significance.

#B-17 (Lack of Interest) by #D-11 (participation levels):

H_0 = Lack of interest is independent of level of use/non-use (participation levels).

Stat.	DF	Value	Prob.
Chi-sq.	12	32.228	0.001
G^2	12	31.897	0.001

The researcher must conclude that lack of interest and participation are dependent; therefore, the data support **rejecting the null hypotheses** at the **.05 level** of significance.

#B-18 (Job Constraints) by #D-11 (participation levels):

H_0 = Job constraints are independent of level of use/non-use (participation levels).

Stat.	DF	Value	Prob.
Chi-sq.	12	25.595	0.01
G^2	12	25.034	0.01

We must conclude that job constraints and participation are dependent; therefore, the data support **rejecting the null hypothesis** at the .05 level of significance.

#B-19 (Low Personal Priority) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0**; low personal priority and participation are independent at the .05 level of significance.

Stat.	DF	Value	Prob.
Chi-sq.	12	10.677	0.55
G^2	12	10.817	0.54

#B-20 (Cost of Participation) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0**; cost of participation and participation are independent at the .05 level of significance.

Stat.	DF	Value	Prob.
Chi-sq.	12	6.828	0.86
G^2	12	7.460	0.82

#B-21 (Family Constraints) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0**; family constraints and participation are independent at the .05 level of significance.

Stat.	DF	Value	Prob.
Chi-sq.	12	17.650	0.12
G^2	12	17.590	0.12

#B-22 (Negative experience K-12) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0**; negative experience K-12 and participation are independent at the .05 level of significance.

Stat.	DF	Value	Prob.
Chi-sq.	12	19.655	0.07
G^2	12	19.145	0.08

#B-23 (Scheduling of learning activities) by #D-11 (participation levels):

H_0 = Scheduling of learning activities is independent of level of use/non-use (participation levels).

Stat.	DF	Value	Prob.
Chi-sq.	12	23.968	0.02
G^2	12	22.553	0.03

The researcher must conclude that scheduling of learning activities and participation are dependent; therefore, the data support **rejecting the null hypothesis** at the .05 level of significance.

#B-24 (Negative experience votech/college) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0**; negative experience votech/college and participation are independent at the .05 level of significance.

Stat.	DF	Value	Prob.
Chi-sq.	12	14.446	0.27
G^2	12	14.598	0.26

#B-25 (Lack of available/desired courses) by #D-11 (participation levels):

H_0 = Lack of available/desired courses is independent of level of use/non-use (participation levels).

Stat.	DF	Value	Prob.
Chi-sq.	12	22.075	0.03
G^2	12	23.305	0.02

The researcher must conclude that lack of available/desired courses and participation are dependent; therefore, the data support **rejecting the null hypothesis** at the .05 level of significance.

#B-26 (Negative experience LRC) by #D-11 (participation levels):

H_0 = Negative experience LRC is independent of level of use/non-use (participation levels).

Stat.	DF	Value	Prob.
Chi-sq.	9	28.516	0.001
G^2	9	32.427	0.001

The researcher must conclude that negative experience LRC and participation are dependent; therefore, the data support **rejecting the null hypothesis** at the .05 level of significance.

#B-27 (Job related burn-out) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0**; job related burn-out and participation are independent at the .05 level of significance.

Stat.	DF	Value	Prob.
Chi-sq.	12	19.992	0.06
G^2	12	20.226	0.06

#B-28 (No Job Advancement) by #B-11 (participation levels)

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0**; no job advancement and participation are independent at the .05 level of significance.

Stat.	DF	Value	Prob.
Chi-sq.	12	15.444	0.21
G^2	12	16.227	0.18

#B-29 (Lack of learning activities to match learning style) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0**; lack of learning activities to match learning style and participation are independent at **the .05 level** of significance.

Stat.	DF	Value	Prob.
Chi-sq.	12	9.184	0.68
G^2	12	9.528	0.65

#B-30 (Lack of recognition by company) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0;** lack of recognition by the company and participation are independent at the **.05 level** of significance.

Stat.	DF	Value	Prob.
Chi-sq.	12	16.186	0.18
G^2	12	13.466	0.33

#B-31 [Lack of information about learning opportunities] by #D-11 [participation]: Data does **not** support rejecting H_0 for independence. **Failure to reject H_0;** lack of information about learning opportunities and participation are independent at the **.05 level** of significance.

Stat.	DF	Value	Prob.
Chi-sq.	12	5.475	0.94
G^2	12	5.415	0.94

#F-32 (Personal Desire) by #D-11 (participation levels):

H_0 = Personal desire is independent of level of use/non-use (participation levels).

Stat.	DF	Value	Prob.
Chi-sq.	12	58.500	0.001
G^2	12	53.932	0.001

The researcher must conclude that personal desire and participation are independent; therefore; the data supports **rejecting the null hypothesis** at the .05 level of significance.

#F-33 (Enjoyment, relaxation, change from routine) by #D-11 (participation levels):

H_0 = Enjoyment, relaxation, change from routine are independent of level of use/non-use (participation levels).

Stat.	DF	Value	Prob.
Chi-sq.	12	39.244	0.001
G^2	12	37.350	0.001

The researcher must conclude that enjoyment, relaxation, change from routine and participation are dependent; therefore, the data support **rejecting the null hypothesis** at the .05 level of significance.

#F-34 (Opportunities to interact) to #D-11 (participation levels):

H_0 = Opportunities to interact are independent of level of use/non-use (participation levels).

Stat.	DF	Value	Prob.
Chi-sq.	12	34.172	0.001
G^2	12	31.612	0.002

The researcher must conclude that opportunities to interact and participation are dependent; therefore, the data support **rejecting the null hypothesis** at the .05 level of significance.

#F-35 (Requirement for Licensure) by #D-11 (participation levels):

H_0 = Requirement for Licensure is independent of level of use/non-use (participation levels).

Stat.	DF	Value	Prob.
Chi-sq.	12	20.488	0.05
G^2	12	25.503	0.01

The researcher must conclude that requirement for licensure and participation are dependent; therefore, the data support **rejecting the null hypothesis** at the .05 level of significance.

#F-36 (Encouragement from the Company) by #D-11 (participation levels):

H_0 = Encourage from the company is independent ov level of use/non-use (participation levels).

Stat.	DF	Value	Prob.
Chi-sq.	12	21.697	0.04
G^2	12	20.874	0.05

The researcher must conclude that encouragement from the company and participation are dependent; therefore, the data support **rejecting the null hypothesis** at the .05 level of significance.

#F-37 (Encouragement from Family) by #D-11 (participation levels):

H_0 = Encouragement from family is independent of level of use/non-use (participation levels).

Stat.	DF	Value	Prob.
Chi-sq.	12	20.565	0.05
G^2	12	20.851	0.05

The researcher must conclude that encouragement from family and participation are dependent; therefore, the data support **rejecting the null hypothesis** at the .05 level of significance.

#F-38 (Opportunity for Community Recognition) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0**; opportunities for community recognition and participation are independent at the .05 level of significance.

Stat.	DF	Value	Prob.
Chi-sq.	12	7.563	0.81
G^2	12	7.662	0.81

#F-39 (Job Advancement) by #D-11 (participation levels)

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0**; job advancement and participation are independent at the .05 level of significance.

Stat.	DF	Value	Prob.
Chi-sq.	12	11.235	0.50
G^2	12	11.649	0.47

#F-40 (Ease of Convenience) by #D-11 (participation levels):

H_0 = Ease of convenience is independent of level of use/non-use (participation levels).

Stat.	DF	Value	Prob.
Chi-sq.	12	45.878	0.001
G^2	12	47.237	0.001

The researcher must conclude that ease of convenience and participation are dependent; therefore, the data support **rejecting the null hypothesis**.

#F-41 (Fear of Obsolescence) by #D-11 (participation levels):

Data does **not** support rejecting H_0 for independence. **Failure to reject H_0**: fear of obsolescence and participation are independent at the .05 level of significance.

Stat.	DF	Value	Prob.
Chi-sq.	12	12.668	0.39
G^2	12	13.162	0.35

#F-42 (Financial Assistance) by #D-11 (participation levels):

H_0 = Financial assistance is independent of level of use/non-use (participation levels).

Stat.	DF	Value	Prob.
Chi.sq.	12	31.477	0.002
G^2	12	28.899	0.004

The researcher must conclude that financial assistance and participation are dependent; therefore, the data support **rejecting the null hypothesis** at the .05 level of significance.

#F43 (On-site education advisor) by #D-11 (participation levels):

H_0 = An on-site education advisor is independent of level of use/non-use (participation levels).

Stat.	DF	Value	Prob.
Chi-sq.	12	46.058	0.001
G^2	12	43.818	0.001

The researcher must conclude that an on-site education advisor and participation are dependent; therefore, the data support **rejecting the null hypothesis** at the .05 level of significance.

"Rejecting the Null Hypothesis" for the Test of Independence by Survey Question Number:

#D-1 Gender

#D-7 Marital Status

#B-17 Lack of Interest

#B-18 Job Constraints

#B-23 Scheduling of Learning Activities

#B-25 Lack of Available/Desirable Courses

#B-26 Negative Experience at the LRC

#F-32 Personal Desire

#F-33 Enjoyment, Relaxation, Change from Routine

#F-34 Opportunity to Interact

#F-35 Requirement for Licensure

#F-36 Encouragement from the Company

#F-37 Encouragement from Family

#F-40 Ease of Convenience

#F-42 Financial Assistance

#F-43 On-site Advisor

Section 3:

Correlation Statistics

Correlation is a set of statistical procedures for determining the strength and direction of the relationship between two "quantitative" variables. The correlation coefficient [r] represents the "linear" relationship (association) between two variables.

The purpose of the correlation coefficient is to express in mathematical terms the "degree of relationship" between any variables.

If the correlation coefficient is "squared" [r^2] then the resulting value (coefficient of determination) represents the proportion of common variation in the two variables; i.e., the "**strength**" or "**magnitude**" of the relationship.

A common "first step" of many data analyses that involve more than a few variables is to run a correlation matrix of all variables and then examine it for expected and unexpected significant relationships. A coefficient significant at the .05 level will occur by chance once in every 20 coefficients.

H_0 = There is no linear relationship at the .05 or 5% level.

When $p < .05$, the correlation is significant at the 5% level of significance. The hypothesis of "no linear relationship" is rejected at the 5% level of significance.

Correlation Terms:

1. Two variables are said to correlate positively [+r] when one variable increases in size, and the other variable shows some systematic tendency to increase correspondingly in a uniform way. A high positive correlation is where one variable tends to score similarly on the other variable (high score with high score).
2. Two variables are said to correlate negatively [-r] when, as one variable increases in size, the other shows some systematic tendency to decrease correspondingly in a uniform way. A high negative correlation is where one variable tends to score the opposite on the other (high score with low score).
3. Two variables are said not to correlate when as one of the variables increases in size, the other variable shows no overall tendency to increase systematically or decrease

systematically. Alternatively, a perfect correlation exists when one variable is correlated to itself. The effect is the perfect r=1.000.

The value of a correlation coefficient [r] can range from −1.00 to +1.00. Values of r close to +1 or −1 indicate that the points lie close to a straight vertical line. **The more r departs from zero (approaches +1 or −1) the stronger the relationship.** Conversely, **r's close to zero basically show no relationship.** The original reasoning behind calculating correlation statistics is to quantify the **magnitude** of the relationship between quantitative variables.

Therefore, in this study, we are interested in determining the direction and strength of the relationship between one barrier and other barriers; barriers and facilitators; and one facilitator and all other facilitators to determine the strength of the relationship. Thus, all variables are correlated to each other to determine:

- The direction of the relationship being negative or positive;
- The degree of relationship, which may vary from perfect to no relationship; and
- The relationship, which may be linear or non-linear.

Note that correlation does not require an explanatory-response relationship between variables. Therefore, an r value should be interpreted with caution; r measures only linear relationships to the exclusion of other important aspects of the data. ***Thus, a strong r value does not imply a cause and effect relationship.***

The correlation between variables "barriers" and "facilitators" when they are measured for every member in the population is the population correlation. The "P" stands for the Greek letter [Rho] and is the r value for the population. Where:

H_0: Rho = 0 = No linear relationship exists in the population.

Pearson Correlation Coefficients/Prob> absolute value R under H_0: Rho = 0/number of observations. H_A: p > = 0.

Since r is not a complete description of two variable data, the means and standard deviations of both barriers and facilitators are provided along with the r.

In this study the r value is used to determine **if a large number of the r's are significant** in order to properly assess the factorability of the r matrix. This is accomplished because the basic assumption of factor analysis is that some underlying structure (or set of cumulative factors) does exist in the set of selected variables.

Correlation Analysis

Relationships between: Barriers and Barriers; Barriers and Facilitators for Significance

Pearson Correlation Coefficients Matrix

	B16	B17	B18	B19	B20	B21	B22	B23	B24	B25	B26	B27	B28	B29	B30	
B31																
B16	1.000	0.156	0.025	0.116	0.225	-0.011	0.515	0.085	0.290	0.166	0.270	0.226	0.079	0.217	0.145	0.278
B17	0.156	1.000	0.060	0.349	0.092	0.007	0.153	0.067	0.101	0.242	0.156	0.179	0.159	0.280	0.214	0.207
B18	0.025	0.060	1.000	0.089	0.070	0.220	0.064	0.362	0.110	0.061	-0.001	0.189	0.214	0.177	0.098	0.090
B19	0.116	0.349	0.089	1.000	0.137	0.178	0.111	0.115	0.105	0.238	0.129	0.157	0.087	0.233	0.122	0.144
B20	0.225	0.092	0.070	0.137	1.000	0.138	0.348	0.170	0.374	0.198	0.384	0.276	0.135	0.340	0.342	0.475
B21	-0.011	0.007	0.220	0.178	0.138	1.000	0.029	0.169	0.061	0.019	0.098	0.186	0.124	0.137	0.197	0.165
B22	0.515	0.153	0.064	0.111	0.348	0.029	1.000	0.138	0.569	0.188	0.432	0.336	0.064	0.350	0.232	0.349
B23	0.085	0.067	0.362	0.155	0.170	0.169	0.138	1.000	0.195	0.245	0.141	0.202	0.137	0.180	0.138	0.089
B24	0.290	0.101	0.110	0.105	0.374	0.061	0.569	0.195	1.000	0.176	0.536	0.287	0.137	0.284	0.338	0.249
B25	0.166	0.242	0.061	0.238	0.198	0.019	0.188	0.245	0.176	1.000	0.229	0.195	0.058	0.333	0.253	0.197
B26	0.270	0.156	-0.001	0.129	0.384	0.098	0.432	0.141	0.536	0.229	1.000	0.265	0.136	0.340	0.391	0.444
B27	0.226	0.179	0.189	0.157	0.276	0.186	0.336	0.202	0.287	0.195	0.265	1.000	0.307	0.334	0.311	0.360
B28	0.079	0.159	0.214	0.087	0.135	0.124	0.064	0.137	0.137	0.058	0.136	0.307	1.000	0.219	0.299	0.144
B29	0.217	0.280	0.177	0.233	0.340	0.137	0.350	0.180	0.284	0.333	0.340	0.334	0.219	1.000	0.387	0.394
B30	0.145	0.214	0.098	0.122	0.342	0.197	0.232	0.138	0.338	0.253	0.391	0.311	0.299	0.387	1.000	0.399
B31	0.278	0.207	0.009	0.144	0.475	0.165	0.349	0.089	0.249	0.197	0.444	0.360	0.144	0.394	0.399	1.000
F32	-0.038	-0.131	0.016	-0.115	0.061	0.052	-0.019	0.113	-0.062	0.018	0.004	-0.037	0.015	0.038	-0.013	0.049
F33	0.039	-0.144	0.104	-0.113	0.040	0.095	0.029	0.135	-0.020	0.079	0.115	0.006	0.059	0.165	0.103	0.158
F34	-0.003	-0.096	0.011	-0.138	0.109	-0.019	-0.005	0.052	0.004	0.103	0.078	0.061	0.021	0.104	0.220	0.158
F35	0.052	-0.054	0.003	0.039	0.083	0.119	0.137	0.069	0.223	0.032	0.212	0.022	-0.032	0.031	0.157	0.144
F36	0.025	-0.094	0.029	-0.005	0.047	0.075	0.018	0.114	0.121	0.001	0.165	0.092	0.0555	0.110	0.162	0.124
F37	-0.034	-0.074	0.055	-0.068	0.118	0.032	-0.012	0.085	0.073	-0.006	0.033	-0.024	-0.030	0.063	0.130	-0.005
F38	0.031	-0.081	0.073	-0.040	0.124	-0.038	0.129	0.034	0.179	0.057	0.130	0.063	-0.116	0.118	0.223	0.173
F39	0.021	-0.035	-0.015	0.017	0.121	0.104	0.053	-0.012	0.098	0.039	0.152	0.094	-0.089	-0.031	0.127	0.117
F40	0.079	-0.027	0.079	0.049	-0.015	0.064	-0.064	0.164	0.044	0.038	0.067	0.009	0.150	0.035	0.014	0.015
F41	0.190	0.026	0.142	0.075	0.075	0.061	0.109	0.093	0.149	0.166	0.167	0.117	0.152	0.047	0.017	0.101
F42	0.031	-0100	0.005	-0.100	0.131	0.094	.0.030	0.099	0.034	0.059	0.158	-0.005	-0.039	0.060	0.102	0.132
F43	0.102	-0.075	0.135	0.002	0.086	0.070	0.053	0.138	0.055	0.061	0.131	0.099	0.026	0.075	0.070	0.126

Relationships between Facilitators and Facilitators Testing for Significance

Pearson Correlation Coefficients Matrix

	F32	F33	F34	F35	F36	F37	F38	F39	F40	F41	F42	F43
F32	1.000	0.526	0.360	0.166	0.133	0.250	0.175	0.199	0.217	0.113	0.355	0.292
F33	0.526	1.000	0.517	0.231	0.270	0.219	0.261	0.215	0.291	0.259	0.356	0.300
F34	0.360	0.517	1.000	0.249	0.224	0.300	0.380	0.205	0.275	0.193	0.374	0.366
F35	0.166	0.231	0.249	1.000	0.331	0.250	0.175	0.199	0.217	0.113	0.355	0.292
F36	0.133	0.270	0.224	0.331	1.000	0.376	0.283	0.376	0.224	0.182	0.158	0.178
F37	0.250	0.219	0.300	0.356	0.376	1.000	0.421	0.329	0.255	0.063	0.278	0.266
F38	0.175	0.261	0.380	0.273	0.283	0.421	1.000	0.363	0.145	0.140	0.226	0.266
F39	0.199	0.215	0.205	0.293	0.376	0.329	0.363	1.000	0.262	0.211	0.172	0.248
F40	0.217	0.291	0.275	0.191	0.224	0.255	0.145	0.262	1.000	0.248	0.243	0.402
F41	0.113	0.259	0.193	0.240	0.182	0.063	0.140	0.211	0.248	1.000	0.349	0.234
F42	0.355	0.356	0.374	0.229	0.158	0.278	0.226	0.172	0.243	0.349	1.000	0.485
F43	0.292	0.300	0.366	0.250	0.178	0.266	0.266	0.248	0.402	0.234	0.485	1.000

Facilitators and Facilitators

Probabilities of Significance at the .05 level of Significance

	F32	F33	F34	F35	F36	F37	F38	F39	F40	F41	F42	F43
F32		0.0001	0.0001	0.0035	0.0192	0.0001	0.0020	0.0004	0.0001	0.0456	0.0001	0.0001
F33	0.0001		0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
F34	0.0001	0.0001		0.0001	0.0001	0.0001	0.0001	0.0003	0.0001	0.0006	0.0001	0.0001
F35	0.0035	0.0001	0.0001		0.0001	0.0001	0.0001	0.0001	0.0008	0.0001	0.0001	0.0001
F36	0.0192	0.0001	0.0001	0.0001		0.0001	0.0001	0.0001	0.0001	0.0012	0.0053	0.0017
F37	0.0001	0.0001	0.0001	0.0001	0.0001		0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
F38	0.0020	0.0001	0.0001	0.0001	0.0001	0.0001		0.0001	0.0108	0.0133	0.0001	0.0001
F39	0.0004	0.0001	0.0003	0.0001	0.0001	0.0001	0.0001		0.0001	0.0002	0.0024	0.0001
F40	0.0001	0.0001	0.0001	0.0008	0.0001	0.0001	0.0108	0.0001		0.0001	0.0001	0.0001
F41	0.0456	0.0001	0.0006	0.0001	0.0012		0.0133	0.0002	0.0001		0.0001	0.0001
F42	0.0001	0.0001	0.0001	0.0001	0.0053	0.0001	0.0001	0.0024	0.0001	0.0001		0.0001
F43	0.0001	0.0001	0.0001	0.0001	0.0017	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	

While the significance level calculated for each correlation is a primary source of information about the reliability of the correlation researchers must be concerned about

other important influences on the data.

Sample size, for example, can seriously affect research results, because the test of significance is based on the assumption that the distribution of the residual values for the dependent variable *y* follows the normal distribution, and that the variability of the residual values is the same for all values of the independent variable *x*. Many researchers follow a 'rule of thumb' that if the sample size is 50 or more then serious biases are unlikely, and if the sample size is over 100 then one should not be concerned at all the normality assumptions.

There are, however, other concerns in terms of threats to validity. One concern is the occurrence of "outliers" in the data. Outliers are atypical (by definition), infrequent extreme observations. Outliers have a profound influence on the slope of the regression line and consequently on the value of the correlation coefficient. A single outlier is capable of considerably changing the slope of the regression line and, consequently, the value of the correlation. Just one outlier can be entirely responsible for a medium to high value of the correlation that otherwise would be much lower or close to zero. Accordingly, it is important that major or significant conclusions are not based on the value of the correlation coefficient alone. In addition to visually inspecting the graphical (i.e., scatterplots), there is a quantitative approach to outliers. Some researchers use quantitative methods to exclude outliers. Another 'rule of thumb' is for researchers to exclude observations that are outside the range of "plus or minus 2" or even "plus or minus 1.5" standard deviations. The following simple statistics for the barriers and facilitators of this study indicate the population, mean, standard deviation and the minimum and maximum variable values to confirm that this data does not require the

"statistical cleaning" process described above for the treatment of outliers

Variable	N	Mean	Std. Dev.	Minimum	Maximum
B16	309	1.8382	1.0659	1.0000	5.0000
B17	311	2.6013	1.1620	1.0000	5.0000
B18	312	3.1955	1.3948	1.0000	5.0000
B19	312	2.8782	1.3291	1.0000	5.0000
B20	310	1.8065	1.0403	1.0000	5.0000
B21	311	2.9775	1.4175	1.0000	5.0000
B22	312	1.8013	1.1136	1.0000	5.0000
B23	309	2.8026	1.3828	1.0000	5.0000
B24	312	1.8237	1.0196	1.0000	5.0000
B25	311	2.3762	1.2274	1.0000	5.0000
B26	309	1.6505	0.9505	1.0000	4.0000*
B27	311	2.3955	1.2730	1.0000	5.0000
B28	310	2.9742	1.4457	1.0000	5.0000
B29	310	2.1774	1.1137	1.0000	5.0000
B30	311	2.0547	1.1473	1.0000	5.0000
B31	311	1.8135	1.0644	1.0000	5.0000
F32	310	3.2613	1.3242	1.0000	5.0000
F33	308	2.9545	1.3106	1.0000	5.0000
F34	309	2.7443	1.2777	1.0000	5.0000
F35	307	2.5081	1.2190	1.0000	5.0000
F36	310	2.3129	1.2703	1.0000	5.0000
F37	310	2.8226	1.3210	1.0000	5.0000
F38	308	2.3214	1.1460	1.0000	5.0000
F39	310	2.5355	1.3994	1.0000	5.0000
F40	309	3.1197	1.3075	1.0000	5.0000
F41	310	2.5968	1.3104	1.0000	5.0000
F42	308	2.8442	1.4557	1.0000	5.0000
F43	306	3.2288	1.4211	1.0000	5.0000

- Please note B26 where the highest score of all responses was a "4" even though the scale was 1 – 5.

Section 4:

Principal Components of Factor Analysis

As was shown in Section (3), *supra*, a correlation analysis was conducted on this study. The results dictated the need for a higher-order data reduction technique that could systematically summarize large correlation matrices indicative of the matrices displayed in Section 3. Correlation coefficients are at the heart of factor analysis.

The main applications of factor analytic techniques are to: (1) reduce the number of independent variables, and (2) detect structure in the relationships between variables. Factor analysis is a good tool to identify and summarize the many inter-relationships that exist among the individual variables and to classify those variables. This statistic is often used as a screening process of variables for inclusion in subsequent statistical investigations such as discriminant function analysis (DFA) discussed in Section 5.

Factor analysis can be used to identify sets of statements that result in highly correlated responses with each set representing a different descriptive factor. The obvious benefit from this "extrapolation" of the data is to condense and summarize information across a smaller set of new composite dimensions or factors. The factor analysis procedure can be thought of as removing 'duplicated' information from the variables or as the grouping of similar variables.

Sixteen barrier variables and 12 facilitators variables were analyzed for the current study. After running a factor analysis procedure, the number of variables under investigation were reduced to four barrier factors and three facilitator factors. Presumably, virtually all the information inherent in the original 28 variables was now present in these seven factors. In this case some overlap existed between the factors since the original set of defining variables did, in fact, experience some degree of correlation with some of the other variables as demonstrated in the correlation matrices.

Principal components is a linear combination of the observed variables such that it accounts for the maximum variance. The extraction of principal components amounts to a variance maximizing *(varimax)* rotation (utilized in this study) of the original variable space. This type of rotation is called variance maximizing because the criterion for the

rotation is to maximize the variance or variability of the "new" variable (factor), while minimizing the variance around the new variable. The specific variances for both barriers and facilitators by each derived factor appear later in this section. The primary objective of factor rotation, then, is to make each artificial factor as uniquely distinctive as possible. The level of variance accounted for "before" and "after" rotation are exhibited later in this section. The total level of variance accounted for by the sum of all factors is the same "before" and "after" rotation. Factor rotation does not change results. It does not change the number of factors under investigation nor in the total variance explained.

The second principal component is orthogonal (uncorrelated) to the first component and accounts for the maximum amount of residual variance. In this manner, consecutive factors, independent of each other, are extracted. The first extracted factor accounts for the largest portion of the total variance and each successive factor accounts for less and less variance. An Eigenvalue is a measure of how much variance each successive factor extracts. The Eigenvalues correspond to the equivalent number of variables which the factor represents.

The Kaiser criterion refers to the standard of retaining only factors with Eigenvalues greater than 1. Therefore, unless a factor extracts at least as much as the equivalent of one original variable, it is not selected for inclusion in the new factor. Later in this section Kaiser's Measure of Sampling Adequacy (MSA) is discussed providing individual as well as an over-all MSA measurement. Kaiser's MSA Index ranges from zero to 1.0 with 1.0 representing a perfect prediction with no error between other

variables. The measure can be interpreted under the following guidelines. An MSA measurement result of:

.90	Marvelous
.80	Meritorious
.70	Middling
.60	Mediocre
.50	Miserable
<.50	Unacceptable

Application of the MSA criterion for this study resulted in **an over-all MSA for barriers of .8226972** and **an over-all MSA for facilitators of .82592592**. Therefore, using the Kaiser's Measure of Sampling [MSA] for this study the results fall into the **"meritorious"** rating category for both barriers and facilitators.

The "scree test" is a graphical charting method which plots Eigenvalues in a simple line plot to find the place where the 'smooth decrease of Eigenvalues appears to level off' to the right of the plot. The idea of the scree test is that the factors along the tail of the curve represent mostly random error variance and, therefore, should assist the researcher select the factor solution just prior to the levelling of the curve. Using this criterion helps the researcher determine how many factors to retain. Analysts do not expect that the factors will extract "all variance from the items"; rather only that proportion that is due to the common factors and shared by several items. It is the proportion of variance of a particular item that is due to common factors which is called "communality".

Communalities are estimated for each variable and those results are displayed later in this section, along with the scree test and other important components of this statistical analysis.

For the purposes of interpretation, "large" communalities indicate a large amount of variation has been explained by the factor solution while "small" communalities indicate that a smaller proportion of the variance in the variable is unaccountable. The term "factor loadings" simply refers to the correlation coefficients between the "original" investigated variables and the "newly derived descriptive" variables as they are extracted. Since it is the task of the factor analysis to form a reduced set of factors that are "relatively independent," it is presumed that the variables defining the first factor are more highly correlated with one another than they are with the variables defining the remaining factors.

As pointed out in Hair's (1995) Chapter Seven on Factor Analysis in *Mulitvariation Data Analysis with Readings* (p. 385), "Research has demonstrated that factor loadings have substantially larger standard errors than typical correlations; thus, factor loadings should be evaluated at considerably stricter levels." "For example, in a sample of 100 respondents, factors loadings of .55 and above are significant; however, in a sample of 50, a factor loading of .75 is required for significance. The guidelines for Identifying Significant Factor Loadings Based on Sample Size, as shown on p. 385 of Hair's book are::

Factor Loading	Sample Size Needed for Significance
.30	350
.35	250
.40	200
.45	150
.50	120
.55	100
.60	85
.65	70
.70	60
.75	50

Using this guideline for the purposes of this study, it appears the researcher's sample size is adequate for the factor loads resulting from the factor analysis.

Here are the results from running a factor analysis on the SAS computer program for this study:

- A chart containing Partial Correlations Controlling all other Variables
- A Scree Plot of Eigenvalues
- Kaiser's Measure of Sampling Adequacy [MSA]
- Final Communality Estimates
- Rotated Factor Pattern [Variance explained by each factor "after rotation"]
- Resulting high factor loadings by individual variables and Factor Names.

Factor Analysis of Barriers:

Kaiser's Measure of Sampling Adequacy: Overall MSA = 0.82269721

B16	**B17**	**B18**	**B19**
0.802419	0.757067	0.681127	0.739506
B20	**B21**	**B22**	**B23**
0.887194	0.729915	0.780052	0.762750
B24	**B25**	**B26**	**B27**
0.780785	0.819745	0.866799	0.904120
B28	**B29**	**B30**	**B31**
0.764089	0.904981	0.854924	0.835119

Variance Explained by Each Factor (Prior to Rotation)

Factor 1	Factor 2	Factor 3	Factor 4
4.380159	1.593287	1.287887	1.127380

Rotated Factor Pattern/Varimax Rotation Method

	Factor 1	Factor 2	Factor 3	Factor 4
B16	0.64442	-0.09758	0.19596	0.03131
B17	0.03586	0.15792	0.75974	-0.13358
B18	-0.01943	0.20037	0.00140	0.75520
B19	-0.00174	0.09523	0.70572	0.10904
B20	0.48889	0.45288	0.02898	0.01670
B21	-0.11715	0.49768	-0.03120	0.35019
B22	0.82637	0.02784	0.10482	0.09841
B23	0.16378	0.02723	0.15734	0.76750
B24	0.74827	0.17178	-0.02147	0.09692
B25	0.25543	0.00051	0.56806	0.20917
B26	0.65131	0.35108	0.07084	-0.08093
B27	0.30573	0.47704	0.16627	0.26668
B28	-0.05844	0.610003	0.05773	0.13745
B29	0.37325	0.41102	0.41250	0.09692
B30	0.27103	0.67861	0.18928	-0.03317
B31	0.44040	0.56475	0.12498	-0.05186

Variance Explained by Each Factor (After Rotation)

Factor 1	Factor 2	Factor 3	Factor 4
2.932360	2.238833	1.731950	1.485571

Final Communality Estimates: **Total = 8.388713**

B16	B17	B18	B19
0.464174	0.621270	0.610853	0.518999
B20	**B21**	**B22**	**B23**
0.445231	0.385022	0.704334	0.641374
B24	**B25**	**B26**	**B27**
0.599276	0.431682	0.559032	0.419799
B28	**B29**	**B30**	**B31**
0.39770	0.487800	0.570898	0.531199

Factor Analysis of Facilitators:

Kaiser's Measure of Sampling Adequacy: Overall MSA = 0.82592592

F32	F33	F34	F35	F36	F37
0.778824	0.788905	0.864897	0.879572	0.846612	0.810010
F38	**F39**	**F40**	**F41**	**F42**	**F43**
0.841234	0.860047	0.837160	0.748195	0.803659	0.840511

Varance Explained by Each Factor (Prior to Rotation):

Factor 1	Factor 2	Factor 3
4.009380	1.341356	1.049063

Rotated Factor Pattern/Varimax Rotation Method

	Factor 1	Factor 2	Factor 3
F32	0.07344	0.77970	0.04460
F33	0.14151	0.74625	0.20684
F34	0.25808	0.69793	0.13518
F35	0.62638	0.05990	0.21642
F36	0.68300	0.03860	0.19037
F37	0.71832	0.26480	-0.03794
F38	0.61823	0.32203	-0.03030
F39	0.64070	0.06203	0.27936
F40	0.24805	0.20095	0.53107
F41	0.06213	0.01386	0.81778
F42	0.09133	0.52417	0.50386
F43	0.22628	0.41309	0.51327

Varance Explained by Each Factor (After Rotation):

Factor 1	Factor 2	Factor 3
2.384497	2.320655	1.694648

Final Communality Estimates: Total = 6.3998800

F32	F33	F34	F35	F36	F37
0.615321	0.619700	0.571980	0.442777	0.504224	0.587547
F38	**F39**	**F40**	**F41**	**F42**	**F43**
0.486828	0.492389	0.383947	0.672816	0.536975	0.485295

Derived Factors from Barrier Variables

Negative Factor

Variable	Factor Loading	Related Survey Question Topic
B22	.83	Negative experience w/prior learning in K-12
B24	.75	Negative experience w/prior learning at votech/college
B26	.65	Negative experience w/prior learning at LRC
B16	.64	Lack of confidence

Extrinsic Lacking Factor

Variable	Factor Loading	Related Survey Question Topic
B30	.68	Lack of recognition for participating in learning activities
B28	.61	Lack of job advancement opportunities
B31	.56	Lack of information about available learning activities
*B21	.50	Family constraints

Intrinsic Lacking Factor

Variable	Factor Loading	Related Survey Question Topic
B17	.76	Lack of interest in learning opportunities
B19	.71	Low personal priority of learning
B25	.57	Lack of desired courses available
B29	.41	Lack of learning opportunities to match learning style

Constraints Factor

Variable	Factor Loading	Related Survey Question Topic
B23	.77	Scheduling constraints [location/distance/time]
B18	.76	Job constraints [lack of relief help, shift work, O.T.]
*B21	.35	Family constraints
B27	.27	Job-related burnout

- **Please note** variables marked with an asterisk are listed on two factors indicating an overlap exists due to moderate high loadings on both factors.

Derived Factors From Facilitator Variables

Encouragement Factor

Variable	Factor Loading	Related Survey Question Topic
F37	.72	Encouragement from family
F36	.68	Encouragement from external source (employer)
F39	.64	Job advancement with potential for better income
F35	.63	Requirement for maintenance of licensure/technical skills

Personal Factor		
Variable	**Factor Loading**	**Related Survey Question Topic**
F32	.78	Personal desire to learn/intellectual interest
F33	.75	Enjoyment/relaxation/change of pace from routine
F34	.70	Opportunity to meet/interact/exchange ideas w/others
*F42	.52	Affordable learning opportunities/financial assistance

Motivator Factor		
Variable	**Factor Loading**	**Related Survey Question Topic**
F41	.82	Fear of Obsolescence, keeping up with technology
F40	.53	Ease of convenience to learning opportunities
F43	.51	On-site counselor to offer education advice
*F42	.50	Affordable learning opportunities/financial aid

- **Please note** variables marked with an asterisk are listed on two factors indicating an overlap exists due to moderate high loadings on both factors.

Large communalities indicate a large amount of variation in the variable has been explained by the factor solution. Here are the rank ordered "highest communality" estimates for this study:

Highest Barrier Communalities Estimates		
Variable	**Communality Estimates**	**Related Survey Question Topic**
B22	.70	Negative experience w/prior learning in K-12
B23	.64	Scheduling constraints (location/distance/time)
B17	.62	Lack of interest in learning opportunities
B18	.61	Job constraints, lack of relief help, shift work/OT
B24	.60	Negative experience w/learning votech/college
B30	.57	Lack of recognition for participating in learning
B26	.56	Negative prior learning experiences at LRC

Highest Facilitator Communalities Estimates		
Variable	**Communality Estimates**	**Related Survey Question Topic**
F41	.67	Fear of obsolescence, keeping up with technology
F33	.62	Enjoyment/relaxation provided/change of pace/routine
F32	.62	Personal desire to learn/intellectual interest
F37	.59	Encouragement from family
F34	.57	Opportunity to meet/interact/exchange ideas w/others

The naming of factors is often thought of as a "double-edged" sword in the use of the factor analysis. On one hand, giving "high-loading variables" of each factor a "descriptive name" attempts to describe common elements or abstraction of the individual variables which load high on the factors. On the other hand, some researchers prefer using the simple numerical labels of factors to avoid misleading or jeopardizing the results of the study. Still, the "insightful" naming of the factors remains one of the greatest contributions of the analysis. The rationale for the names selected for the purposes of this study are self-evident.

In summary, factor analyses do not create new information for the study. It merely organizes, summarizes and quantifies information that can provide deeper insight, understanding and focus for a wide range of problems, and hopefully, the necessary information for their solutions.

Section 5:

Discriminant Function Analysis

Discriminant Function Analysis (DFA) is used in this study to determine whether two groups (participants and non-participants) differ significantly with regard to the mean of a variable and then to use that variable to predict group membership. DFA resolves which independent variables discriminate between two or more naturally occurring

groups. Thus, DFA, identifies which variables are the best predictors for group membership.

DFA is the appropriate statistical technique when the dependent variable is categorical (nominal or non-interval) and the independent variables are interval. Although the DFA statistic is capable of handling three or more groups, for the purposes of this study the DFA performed was a two-group discriminant analysis.

DFA involves "deriving a variate" (similar to the factor analysis technique "deriving a factor" from original variables) that will discriminate best between *a priori* defined groups. *A priori* (from the former) means when the probability can be determined from known characteristics of the sample space (known from the physical characteristics of the experiment) before an experiment is performed. Therefore, DFA is deductive by nature.

Discrimination is achieved by setting the variate's weights for each variable to maximize the "between-group" variance relative to the "within-group" variance.

By averaging the discriminant scores for all the individuals within a particular group, a group means (called a centroid) is calculated. Since this analysis involves two groups, participants and non-participants, there are two centroids. The centroids:

1. Indicatethe most typical location of any individual from a particular group, and
2. Show how far apart the groups are along the dimension being tested.

The statistical significance test for the DFA is a measure of the distance between the group centroids. If small overlap occurs in the distribution pattern, then it can be said that the DFA separates the groups well. If a large overlap exists, the discriminant function is deemed to be a poor discriminator between the groups.

The SAS statistical computer software package provides "b" coefficients (and standardized beta) for each variable in each discriminant or canonical function. The larger the standardized coefficient (either plus or minus), the greater the contribution of the variable to the discrimination between groups.

The DFA is simply trying to ascertain which of the characteristics in this study best separates and identifies participants from non-participants.

In summary, the DFA:

1. Identifies the variables with the greatest differences between groups and derives a discriminant weighted coefficient for each variable to reflect these differences.
2. Uses the weights and each individual's ratings on the selected survey questions to develop the discriminant score for each respondent, and
3. Assigns each respondent to a group according to the discriminant function score, based on the "cutoff score", which is the average of the two group means for equal sized groups.

The reasoning behind using the DFA is to maximize the variance "between" the two groups while minimizing the variance "within" them. DFA looks for a large variance "between" groups to best separate or distinguish between the groups.

The two research questions that DFA successfully addresses for this study are:

1. To determine whether statistically significant differences exist between the average score profiles on a set of variables for two *a priori* defined groups, and/or
2. To determine which independent variables account for most of the differences in the average score profiles of the two groups.

This study was designed to better understand group differences and to correctly classify statistical units into groups so as to create a type of profile analysis from which to predict membership.

Sample Size

For the purposes of validating this statistical analysis, the population of respondents were separated into two groups: the "analysis sample" and the "hold-out or validation sample." The analysis sample was used to develop the discriminant function. The validation or hold-out sample was used to test the DF. In this case, a 75% - 25% split was selected as sufficient because the sample was large enough to support this split (total of 311 usable responses, where the respondents answered all applicable survey questions). From the literature a 'rule of thumb' would be to have at least 100 in the total sample to justifying dividing it into the two groups. The split ratio in this study was:

Analysis sample of 227 observations
Validation sample of 73 observations.

Computational Method:

The "backward stepwise-method" was selected because it rendered the best prediction by producing the least amount of misclassifications of group membership while deriving the fewest number of variate loadings which would discriminate best between *a priori* groups. Another reason the backward stepwise method was chosen was because this method is particularly useful in situations with the large number of independent variables (28) in this study. In the backward stepwise analysis, all variables are initially included in the model, then at each step the variable that contributes least to

the prediction of group membership is eliminated. The SAS DFA process result creates a group of the "most important" variables in this model that contribute the most to the discrimination between groups. The backward stepwise procedure is designed to develop the best model by eliminating the unimportant variables until only the most significant variables remain. This reduced set of variates typically is almost as good as—if not better than—the complete set of variables. From the total 28 variables measured in this study, six variables, now referred to as variates, were selected by the SAS DFA process as contributing the most to discrimination between the two groups.

Two methods are used for interpreting the discriminant functions:

(1) Examine the standardized coefficients; these are obtained by multiplying the raw coefficient for each variable by the standard deviation for that variable.

(2) Examine the discriminant function; variable correlations, i.e., the correlations between each discriminant function and each of the original variables.

For both of these methods, the largest (absolute value) coefficients or correlations are used for interpretation. The use of discriminant function-variable correlations for interpretation is parallel to the procedure used in factor analysis, where factor-variable correlations (the so-called factor loadings) are used to interpret the factors.

The summary of the **analysis** sample for the DFA performed on this population is:

227 Observations 226 DF Total
6 Variables 225 DF within classes
2 Classes 1DF between classes

Class Level Information:

Q11	Frequency	Weight	Prior Proportion	Probability
1	179	179.0	0.78	0.78
2	48	48.0	0.21	0.21

The summary of the **validation** sample for the DFA performed on this population is:

73 Observations	72 DF Total
6 Variables	71 DF within classes
2 Classes	1 DF between classes

Class Level Information:

Q11	Frequency	Weight	Prior Proportion	Probability
1	60	60.0	0.82	0.82
2	13	13.0	0.17	0.17

Assumptions:

1. Categorical dependent variables (nominal or non-interval) and independent variables are interval.
2. Multivariate normality of all independent variables (20:1 ratio) is standard. The ratio for the analysis group in this study was 39:1.
3. Equality of variance – covariance matrices across all groups.
4. Lack of collinearity among independent variables.

Wilks' Lambda, Hotelling's Trace and Pillai's Trace all evaluate the statistical significance of the discriminatory power of the discriminant function(s). Roy's greatest characteristic root evaluates only the first DF.

The results of Multivariate Statistics referred to above for the **analysis** sample are:

Statistic	Value	F	Num.DF	Pr > F
Wilks's Lambda	0.88	4.64	6	0.0002
Pillai's Trace	0.11	4.64	6	0.0002
Hotelling-Lawley Trace	0.12	4.64	6	0.0002
Roy's Greatest Root	0.12	4.64	6	0.0002

The results in the **analysis** sample are clearly significant.

The results of Multivariate Statistics referred to above for the **validation** sample are:

Statistic	Value	F	Num.DF	Pr > F
Wilks' Lambda	0.03	0.81	6	0.56
Pillai's Trace	0.06	0.81	6	0.56
Hotelling-Lawley Trace	0.07	0.81	6	0.56
Roy's Greatest Root	0.07	0.81	6	0.56

The results in the **validation** sample are clearly not significant.

The "weighted cutting scores" and the "hit-rate ratio" are measures to be determined before a classification matrix can be constructed. The "cutting score" (against which each individual's discriminant score is judged) is used to determine into which group the individual should be classified. The "optimal" cutting score (critical Z value) must be determined by the analyst based on whether groups are of equal or non-equal size. In this study, the groups were not of equal size; approximately 75% of the population was identified by survey question D-11 as "participants" and approximately 25% of the population was identified as "non-participants." Therefore, the Z_{cu} formula was used to calculate a "weighted" optimal cutting score as follows:

$$Z_{CU} = \frac{N_A Z_A + N_B Z_B}{N_A + N_B}$$

Where Z_{CU} = Critical cutting score value
N_A = Number in group A
N_B = Number in group B
Z_A = Centroid for group A
Z_B = Centroid for group B

The centroid for Group A [Group 1/Participants] for the **analysis** sample = -.18
The centroid for Group B [Group 2/Non-participants] for the **analysis** sample = .68.

The centroid for Group A [Group 1/Participants] for the **validation** sample = -.12
The centroid for Group B [Group2/Non-participants] for the **validation** sample = 0.57.

The computations for the Z_{cu} formula, cited above, for the **analysis** sample:

$N_A = (179)$;	$N_B = (48)$;	$Z_A = (-.1835)$	$Z_B = (.6845)$	$Z_{cu} = .00095$

The computations for the Z_{cu} formula, cited above, for the **validation** sample:

$N_A = (60)$;	$N_B = (13)$;	$Z_A = (-.1248)$	$Z_B = (0.5761)$	$Z_{cu} = .001$

The optimal cutting score is the one that will misclassify the fewest number of individuals in all groups.

The following is the DF for the **analysis** sample [based on the standardized canonical coefficients] for this study:

F33 = -.7106 [Enjoyment/relaxation provided by learning as a change of pace]
F37 = 0.2046 [Encouragement from family]
F40 = 0.2070 [Ease of convenience to learning opportunities]
B21 = -.3926 [Family constraints]
B22 = 0.6645 [Negative experience with prior learning in K-12]
B30 = 0.1000 [Lack of recognition for participating in learning activities].

Thus, the DF formula or profile for the **analysis** sample is = -0.71(F33) + 0.66(B22) + –0.39(B21) +0.20(F40) +0.20(F37) + .10(B30).

The following is the DF for the **validation** sample [based on the standardized canonical coefficients] for this study:

F33 = -.8056 [Enjoyment/relaxation provided by learning as a change of pace]
F37 = 0.1599 [Encouragement from family]
F40 = 0.2849 [Ease of convenience to learning opportunities]
B21 = 0.1501 [Family constraints]
B22 = -.4077 [Negative experience with prior learning in k-12]
B30 = 0.2700 [Lack of recognition for participating in learning activities].

Therefore, the DF formula or profile for the **validation** sample is = : -0.80(F33) -0.41(B22) +0.28 (F40) + 0.27(B30) + 0.16(F37) + 0.15(B21).

It follows, then, that objects with discriminant scores greater than the cutoff score are assigned to one of the criterion groups and objects with discriminant scores less than the cutoff score are assigned to the other group.

If the DF in the **analysis** sample is greater than Z_{cu} .00095, the subject is assigned to Group 1; if DF in the **analysis** sample is smaller than Z_{cu} .00095, the subject is assigned to Group 2.

Likewise, if DF in the **validation** sample is greater than Z_{cu} .001, the subject is assigned to Group 1; if DF in the **validation** sample is smaller than Z_{cu} .001, the subject is assigned to Group 2.

The "hit-ratio" is determined by dividing the number of individuals classified correctly divided by the total.

For the **analysis** sample, the hit-ratio was calculated from the matrix provided numbers. Percent correctly classified: 173 + 4/173+6+44+4 = .78.

For the **validation** sample, the hit-ratio was calculated from the matrix provided numbers. Percent correctly classified: 58 + 0/58 + 2 + 13+ 0 = .79.

Classification matrices are constructed to validate the DF. The procedure involves multiplying the weights generated by the **analysis** sample by the raw variable measurements of the hold-out/**validation** sample. Individual discrimination scores of the hold-out sample are compared with the critical cutting score values and classified:

1. Classify an individual into Group 1/participants if Z_N (discriminate Z score) < Z_{CT} (critical cutting score).
2. Classify an individual into Group 2/non-participants if Z_N (discriminant Z score) > Z_{CT} (critical cutting score).

Maximum Chance Criterion vs. Proportional Chance Criterion:

With approximately 75% of the subjects of this study falling into the participant group and approximately 25% of the subjects of this study falling into the non-participant group, all the subjects could be assigned to the larger group and achieve a 75% classification accuracy without the DF. According to the maximum chance criterion, if the DF renders a classification accuracy of 75% or less, it should be disregarded because it has not improved our prediction accuracy.

But this does not work well when the analyst is using DF to "correctly identify members of all groups." Therefore, the proportional chance criterion should be used in most situations, and it certainly proves useful when computed with a hold-out sample. The formula for the proportional chance criterion is:

$C_{pro} = p2 = (1\text{-}p)^2$ where p = the proportion of the individuals in Group 1 (participants) and 1-0 = the proportion of the individuals in Group 2 (non-participants).

The results for this study in the **analysis** sample is:

C_{pro} = .6084 + .0484 = .6568 or 66% compared with 75%.

The results for this study in the **validation** sample are:

C_{pro} = .6561 + .0361 = .6922 or 69% compared with 75%.

Therefore, a prediction accuracy of 75% (or 79% in the **validation** sample; 78 in the **analysis** sample) is acceptable because it is higher than the 69% for the **validation** sample or 66% for the **analysis** sample proportional chance criterion.

Statistically-based measures of classification accuracy relative to chance:

Press' Q statistic compares the number of correct classifications with the total sample size and the number of groups. The calculated value is then compared with the critical value which is represented by the Chi-square for 1 degree of freedom at the .01 level of confidence. The formula for calculating the Press' Q is:

$$[N-(n * k)]^2 / N (k-1)^2$$

Where "N" = total sample size
"n" = Number of observations correctly classified
"k" = number of groups

For the **analysis** sample of this study the Press' Q statistic is:

Where: N = 227; n = 177 and k = 2

$[227 - (177) (2)]^2 / 227 (2-1) = 71.05$ when compared to the critical value for a Chi-square at the .01 significance level with one degree of freedom [6.63] is found to be greater than the chi-square or "significantly" better than chance.

For the **validation** sample of this study the Press' Q statistic is:

Where: N = 73; n = 58 and k = 2

$[73 - (58) (2)]^2 / 73 (2-1) = 25.32$ when compared to the critical value for a Chi-square at the .01 significance level with one degree of freedom [6.63] is found to be greater than the chi-square or "significantly" better than chance.

Caveats:

Which Method Should Be Used? Loadings vs. Weights:

The loadings approach is somewhat more valid that the use of weights and should be used whenever possible (Hair, 1995).

Need for cross-validation group:

Considering the DFA's propensity to inflate the "hit ratio," it is important to utilize a cross-validation group as was done in this study.

Use of structure coefficient vs. standardized co-efficient:

Structure coefficients tell us something quite different from what is communicated by the standardized coefficients (Klecka, 1980). A structure coefficient tells us how closely a variable and a function are related. When the absolute magnitude of the coefficient is very large [near +1.0 or −1.0), the function is carrying nearly the same information as the variable. When the coefficient is near zero, the function and the variable have very little in common. These structure coefficients are simple bivariate correlations that are not affected by relationships with the other variables. The standardized coefficients take into consideration the simultaneous contributions of all the other variables. Thus, the standardized coefficients are helpful because they can be used to determine which variables contribute most to determining the optimum selection scores on the function.

The classification matrices produced from this study using Linear Discriminant Function is:

Analysis Sample:

No. of Observations and Percent Classified into Q11 (Level of Participation):

From Q11	1	2	Total
	5	0	5
	100.00	0.00	100.00
1	173	6	179
	96.65	3.35	100.00
2	44	4	48
	91.67	8.33	100.00
Total	217	10	217
Percent	95.69	4.31	100.00

Error Count Estimates for Q11/Analysis Sample:

	1	2	Total
Rate	**0.03**	**0.91**	**0.22**
Priors	**0.78**	**0.21**	

Validation Sample:

No. of Observations and Percent Classified into Q11 [Level of Participation]:

From Q11	1	2	Total
	1	0	1
	100.00	0.00	100.00
1	58	2	60
	96.67	3.33	100.00
2	13	0	13
	100.00	0.00	100.00
Total	71	2	73
Percent	97.30	2.70	100.00

Error Count Estimates for Q11/Validation Sample:

	1	2	Total
Rate	**0.03**	**1.00**	**0.20**
Priors	**0.82**	**0.17**	

Canonical Analysis:

Canonical Correlation is an additional procedure for assessing the relationship between variables. This analysis (multivariate correlational technique) allows the analyst to investigate the relationship between two sets of variables. The weighted sums define a canonical root or variate. These canonical variates (weighted sums) describe some underlying "latent" variables. The latent root criterion means only the factors having Eigenvalues (the proportion of variance accounted for by the correlation between the respective canonical variates) greater than 1 are considered significant. All factors with latent roots less than 1 are considered insignificant and should be disregarded. The square root of the Eigenvalues are interpreted as correlation coefficients. Because the correlations pertain to the canonical variates, they are called canonical correlations. It is customary to report the largest correlation for the first root. Simply stated, the different canonical correlations are tested one by one, beginning with the largest one and only those roots that are statistically significant (above 1.0) are retained. The canonical correlation coefficient tells nothing about how much variance each canonical root explains in the variables. However, the canonical factor loadings represent correlations between the canonical variates and the variables in the respect set. If the correlations are squared, the resulting numbers reflect the "proportion" of variance accounted for in each variable. This examination allows the average proportion of variance extracted by each root to be computed.

The Canonical Discriminant Analysis for the **analysis** sample of this study is:

Canonical Correlation	Adjusted Canonical Correlation	Approx. Standard Error	Squared Canonical Correlation
0.335415	0.306805	0.059035	0.112504

Eigenvalue	Proportion	Cumulative
0.12	1.00	1.00

Test of H_0: the canonical correlations in the current row and all that follow are zero.

Likelihood Ratio	Approx. F	Num. DF	Den DF	Pr > F
0.88	4.64	6	220	0.0002

Tot. Canonical Structure	Between Canonical Structure	Pooled W/in Canonical Structure
F33	-0.59	-1.00	-0.57
F37	0.07	1.00	0.07
F40	0.01	1.00	0.01
B21	-0.42	-1.00	-0.40
B22	0.62	1.00	0.60
B30	0.14	1.00	0.13

The Canonical Discriminant Analysis for the **validation** sample of this study is:

Canonical Correlation	Adjusted Canonical Correlation	Approx. Standard Error	Squared Canonical Correlation
.26	.14	.10	.06

Eigenvalue	Proportion	Cumulative
0.07	1.00	1.00

Test of H_0: the canonical correlations in the current row and all that follow are zero.

Likelihood Ratio		Approx. F	Num. DF	Den DF	Pr > F
0.93	0.81	6	66	0.56	

	Tot. Canonical Structure	Between Canonical Structure	Pooled W/in Canonical Structure
F33	-0.73	-1.00	-0.72
F37	0.35	1.00	0.34
F40	0.08	1.00	0.08
B21	0.35	1.00	0.34
B22	-0.47	-1.00	-0.46
B30	0.27	1.00	0.26

Concluding Comments:

The DFA is a prime example of how the individual statistical building blocks of mean, variance, correlation, and factor analysis combine to create a higher-order analytical technique. It is important to note that DFA involves a fusion of the three key functions of statistical analysis: data reduction, inference, and the identification of associations among variables (Kachigan, 1991).

Section 6:

Working Hypotheses

A hypothesis remains a mere educated guess and possesses little explanatory value until empirically verifiable evidence is produced to support it.

The "working" hypotheses posited in Chapter III, *supra*, was to determine what influences the blue-collar worker in an industrial setting to participate in adult education activities in terms of barriers and facilitators.

The use of the "working" hypotheses in this study was to suggest where to search most profitably for facts. It calls for examining an existing condition, combining it with observed facts (in this case, scores on a particular measurement—the survey instrument) and relating the findings to an existing body of theory.

The direct observations from this study to determine whether or not the specific predictions occurred and evaluate if the null hypotheses, as stated herein, are to be accepted or fail to be rejected based on the self-ratings of the respondents of the survey used in this study are:

Hypothesis $_0$ [1]: There is **no significant difference** [at the .05 level] between participants and non-participants of adult education activities with regard to mean scores in the Facilitators to Learning section of the survey in the areas of:

Facilitators	Question No.	Research Bases
Cognitive interest	#32	Boshier/EPS; Burgess/REPS; Morstain & Smart/Factors
Escape/stimulation	#33	
Social relationships	#34	
External expectations	#36 & #37	
Social welfare	#38	

Hypothesis$_A$ [1]: There is a **significant difference** [at the .05 level] between participants and non-participants of adult education activities with regard to mean scores in the Facilitators to Learning section of the survey in the areas of:

Facilitators	Question No.	Research Bases
Cognitive interest	#32	Boshier/EPS; Burgess/REPS; Morstain & Smart/Factors
Escape/stimulation	#33	
Social relationships	#34	
External expectations	#36 & #37	
Social welfare	#38	

Mean Scores:

No.	Measurement Factor	Participants	Non-Participants	T-value	DF	Prob > T
F-32	Cognitive Interest	3.41	2.71	3.82	302	.0002
Conclude: Reject the null hypothesis; the mean scores of participants and non-participants are significantly different at the .05 level.						
F-33	Escape/Stimulus	3.09	2.42	3.65	300	.0003
Conclude: Reject the null hypothesis; the mean scores of participants and non-participants are significantly different at the .05 level.						
F-34	Social Relationships	2.78	2.58	1.08	301	.27
Conclude: Failure to reject the null hypothesis; the mean scores of participants and non-participants are not significantly different at the .05 level.						

No.	Measurement Factor	Participants	Non-Participants	T-value	DF	Prob > T
F-36	External Expect/Co.	2.30	2.38	-.458	302	.64
Conclude: Failure to reject the null hypothesis: the mean scores of participants and non-participants are not significantly different at the .05 level.						

Mean Scores:

No.	Measurement Factor	Participants	Non-Participants	T-value	DF	Prob > T
F-37	External Expect/Family	2.80	2.89	-.447	302	.65
Conclude: Failure to reject the null hypothesis: the mean scores of participants and non-participants are not significantly different at the .05 level.						
F-38	Social Welfare	2.35	2.27	.47	300	.63
Conclude: Failure to reject the null hypothesis: the mean scores of participants and non-participants are not significantly different at the .05 level						

Hypothesis$_0$[2]: There is **no significant difference** between participants and non-participants of adult education activities with regard to mean scores in the Barriers to Learning section of the survey in the areas of:

Barriers	Question No.	Research Basis
Attitudes about education	#22,#24,#26	Cross/COR Model
Lack of information	#31	

Hypothesis$_A$[2]: There is a **significant difference** (at the .05 level) between participants and non-participants of adult education activities with regard to mean scores in the Barriers to Learning section of the survey in the areas of:

Barriers	Question No.	Research Basis
Attitudes about education	#22,#24,#26	Cross/COR Model
Lack of information	#31	

Mean Scores:

No.	Measurement Factor	Participants	Non-Participants	T-value	DF	Prob > T
B-22	Negative Exp. K-12	1.73	2.08	-2.24	304	.02
Conclude: Reject the null hypothesis: the mean scores of participants and non-participants are significantly different at the .05 level.						
B-24	Neg. Exp. Votech/Coll.	1.74	2.14	-2.79	304	.005
Conclude: Reject the null hypothesis: the mean scores of participants and non-participants are significantly different at the .05 level.						
B-26	Negative Exp. LRC	1.60	1.88	-2.07	301	.03
Conclude: Reject the null hypothesis: the mean scores of participants and non-participants are significantly different at the .05 level.						
B-31	Lack of Information	1.78	1.95	-1.20	303	.22
Conclude: Failure to reject the null hypothesis: the mean scores of participants and non-participants are not significantly different at the .05 level						

Hypothesis$_0$[3]: There is **no significant difference** [at the .05 level] between participants and non-participants of adult education activities with regard to mean scores in the Barriers to Learning section of the survey in the areas of:

Barriers	Question No.	Research Basis
Lack of confidence	#16	Scanlon & Darkenwald
Lower personal priority	#17 & #19	
Personal Problems	#21	

Hypothesis$_A$[3]: There is a **significant difference** (at the .05 level) between participants and non-participants of adult education activities with regard to mean scores in the Barriers to Learning section of the survey in the areas of:

Barriers	Question No.	Research Basis
Lack of confidence	#16	Scanlon & Darkenwald
Lower personal priority	#17 & #19	
Personal Problems	#21	

Mean Scores:

No.	Measurement Factor	Participants	Non-Participants	T-value	DF	Prob > T
B-16	Lack of Confidence	1.78	2.06	-1.90	301	.05
Conclude: Failure to eject the null hypothesis: the mean scores of participants and non-participants are not significantly different at the .05 level.						
B-17	Lack of Interest	2.57	2.75	-1.11	303	.26
Conclude: Failure to reject the null hypothesis: the mean scores of participants and non-participants are not significantly different at the .05 level						
B-19	Low Personal Priority	2.85	3.06	-1.15	304	.24
Conclude: Failure to reject the null hypothesis: the mean scores of participants and non-participants are not significantly different at the .05 level						
B-21	Family Constraints	3.05	2.75	1.52	303	.12
Conclude: Failure to reject the null hypothesis: the mean scores of participants and non-participants are not significantly different at the .05 level						

Hypothesis$_0$[4]: There is **no significant difference** (at the .05 level) between participants and non-participants of adult education activities with regard to mean scores in the Barriers to Learning section and in the Facilitators to Learning section of the survey in the areas of:

Barriers	**Facilitators**	**Question No.**
Job & Time/Scheduling Constraints		#18 & #23
Cost of Participating in Learning		#20
Job-related Burnout		#27
Learning activities don't result in job advancement		#28
Research Basis	Job advancement/better income	#39
Hanson & DeMuth	Affordable learning/financial aid	#42

Hypothesis$_A$[4]: There is a **significant difference** (at the .05 level) between participants and non-participants of adult education acitivities with regard to mean scores in the Barriers to Learning section and in the Facilitators to Learning section of the survey in the areas of:

Barriers	**Facilitators**	**Question No.**
Job & Time/Scheduling Constraints		#18 & #23
Cost of Participating in Learning		#20
Job-related Burnout		#27
Learning activities don't result in job advancement		#28
Research Basis	Job advancement/better income	#39
Hanson & DeMuth	Affordable learning/financial aid	#42

Mean Scores:

No.	Measurement Factor	**Participants**	**Non-Participants**	**T-value**	**DF**	**Prob > T**
B-20	Cost of Learning	1.78	1.89	-.747	302	.455
Conclude: Failure to reject the null hypothesis: the mean scores of participants and non-participants are not significantly different at the .05 level						
B-23	Scheduling/Loca/Dist/Time	2.85	2.55	1.56	303	.12
Conclude: Failure to reject the null hypothesis: the mean scores of participants and non-participants are not significantly different at the .05 level						
B-27	Job-related Burnout	2.41	2.39	.11	303	.91
Conclude: Failure to reject the null hypothesis: the mean scores of participants and non-participants are not significantly different at the .05 level						
B-28	No Job Advancement	2.99	2.90	.42	302	.67
Conclude: Failure to reject the null hypothesis: the mean scores of participants and non-participants are not significantly different at the .05 level						
F-39	Job Advancement w/$	2.50	2.70	-.99	302	.32
Conclude: Failure to reject the null hypothesis: the mean scores of participants and non-participants are not significantly different at the .05 level						
F-42	Financial Assistance	2.87	2.75	.62	300	.53
Conclude: Failure to reject the null hypothesis: the mean scores of participants and non-participants are not significantly different at the .05 level						

Hypothesis$_0$[5]: There is **no significant difference** (at the .05 level) between participants and non-participants of adult education activities with regard to mean scores in the Facilitators to Learning section of the survey in the area of:

Facilitator	Question No.
On-Site Educational Advisor	**#43**

Hypothesis$_A$[5]: There is a **significant difference** (at the .05 level) between participants and non-participants of adult education activities with regard to mean scores in the Facilitators to Learning section of the survey in the area of:

Facilitator	Question No.
On-Site Educational Advisor	**#43**

Mean Scores:

No.	Measurement Factor	Participants	Non-Participants	T-value	DF	Prob > T
F-43	On-Site Education Advisor	3.30	3.02	1.40	298	.16
Conclude: Failure to reject the null hypothesis: the mean scores of participants and non-participants are not significantly different at the .05 level						

Section 7:

Results from Open-Ended Questions

This section of the data analysis chapter offers a summary of the data from the perspective of the blue-collar workers. The results from the open-ended questions included at the end of the survey instrument are discussed as follows (Appendix contains the entire transcription of the data collected for each question):

Question 44. What are the greatest obstacles you face that keep you from going back-to-school? (Explain).

No. of Responses marked "**No Obstacles**":	**19**
No. of Responses "**Left Blank**"	**5**
No. of Responses marked "**Not Applicalbe**"	**2**
No. of Responses marked "**Lack of Interest**" or "**No Desire**"	**34**

The following categories combine those found in the survey and in the review of literature and are shown in rank order based solely on the totals for each category:

Note: Response totals are > than the total number of respondents due to multiple answers per respondent.

Time Constraints	**116**
Family Constraints	**66**
Overtime/Shift Work	**43**
Age/Retirement	**39**
Low Priority	**39**
Previous Negative Experience/ Or Lack of Confidence	**16**
Farming &/or Long Distance Commuting	**15**

Question No. 45: What would make it easier for you to go back-to-school?

(Explain).

No. of Responses marked "**Nothing**"	**19**
No. of Responses "**Left Blank**"	**49**
No. of Responses marked "**Not Applicable**"	**3**
No. of Responses marked **"?" or "Don't Know"**	**9**
No. of Responses marked **"Someone to go for me," "Win the lottery," or "To be young again"**	**4**

In Rank Order by Number of Responses:

More Free Time	**45**
Fewer Family Responsibilities	**34**
Less O.T./Shift Change Stability in Scheduling	**31**
Change in Priorities/Loss of Job or Layoff	**22**
Better Class Schedules/Both on and off-site	**19**
Job Advancement; Company Paid Time/More Company Support	**18**
Age/Younger; or Retirement/Older	**16**
Lack of Confidence	**9**
Didn't have to Commute Long Distances	**6**

Question No. 46: **How long has it been** since you attended school (for example, high school, college, votech): [This question also asked type of school and course last taken; this information can be found in a chart in the Appendix.]

Shown Grouped by Years:	**Total**	**Rank Order**
1 – 5 years since last attended school	**56**	**1**
6 – 10 years since last attended school	**23**	**6**
11 – 15 years since last attended school	**18**	**8**
16 – 20 years since last attended school	**31**	**3**
21 – 25 years since last attended school	**41**	**2**
26 – 30 years since last attended school	**29**	**4**
31 – 35 years since last attended school	**22**	**7**
36 – 40 years since last attended school	**26**	**5**
41 – 45 years since last attended school	**5**	**9**
46+ years since last attended school	**2**	**10**

Note: A total of **34 workers** responded they had attended school in the past 1 – 12 months

A total of **24 workers** responded that it had been "years" since they last attended school, but were not specific as to how many years it had been.

Question No. 47: **What would motivate you** the most to "go back-to-school"?

No. of Responses marked "**Nothing**"	**21**
No. of Responses "**Left Blank**"	**48**
No. of Responses marked "**Not Applicable**"	**3**
No. of Responses marked **"?" or "Don't Know" or "I'm not sure"**	**27**

In Rank Order by Number of Responses:

Company paid; On company time; Job advancement; Pay increase/Promotion **54**

Change in condition; Change in priorities; Impending loss of job; Pay decrease **52**

Personal Enjoyment & Satisfaction/Self-improvement **42**

More Time **29**

Change in Scheduling—Work and Classes	**22**
Age (usually after retirement0	**12**
Change in family responsibilities	**7**
More self-confidence	**6**

Note: Response numbers > than the total number of respondents due to multiple answers per respondent.

Question No. 48: Have you made plans to take a votech class, attend a workshop or seminar to learn a new skill or trade 9for example, learn new machine skill; learn to operate a computer; take welding short course, etc.)? If Yes, please describe:

In Rank Order by Number of Responses:

Those responding **"no" [not planning to take a class, learn new skill, etc.]**	**247**
Computer Classes	**27**
Votech	**20**
Professional/College Credit	**20**
Learning Resource Center	**8**

Note: Response numbers are greater than the total number of respondents due to multiple answers per respondent.

These open-ended questions, especially when read in the respondents' words (see Appendix), offer a "value-added" element to this entire study. In one way, worker responses can be used to validate the numerical scoring of the survey instrument. In quite another way, these responses offer a qualitative approach to learning more about worker concerns, priorities, obstacles, motivators, and provide depth to the study that otherwise would be lacking. Sometimes it takes "going to the source's mouth" to get the "real answers."

CHAPTER V

Summary of Findings

The problem expressed in this study was the existing **need to understand the effects of barriers and facilitators on patterns of participation in adult education by blue-collar workers. Analysis of these patterns experienced by both production (non-skilled labor) and skilled trades workers in an industrial setting can help explain why this very important segment of the U. S. population, who could benefit most from adult education actually participate the least**. It is imperative, then, to determine whether their participation or non-participation is a function of barriers and facilitators to participation of adult education as described in the review of literature.

The purpose of this study is three-fold:

1. Previous quantitative studies measuring variables and their inter-relatedness have failed to adequately describe the blue-collar worker population in terms of identifying barriers and facilitators to participation in adult education. Measuring orientation interaction as predictors and boasting of good predictive validity for Boshier's (A-Form) and its psychometric properties leave something to be desired and, in this case, that something is the industrial worker, his life experiences, motivations and the importance he places on such things.

2. An industrial setting study was needed to investigate worker motivation towards education. Explanations of how their life experiences could be interpreted, in terms of barriers and facilitators to worker participation in adult education opportunities, would be useful to educators and industry.

3. A comparison of the findings from this study to earlier studies that have

identified barriers and facilitators of different populations will be conducted.

Summary of Prior Research:

Here are the findings of major researchers in this field with which to compare the findings from this study:

Boshier's early studies identified motivators through the use of his Education Participation Scale (EPS). His purported motives included the need for:

Social Contact
Social Stimulation
Job Advancement
Community Service
External Expectations
Cognitive Interest.

Morstain and Smart (1974) conducted a factor analysis of Boshier's EPS and Burgess' Reasons for Educational Participation Scale (REPS) (1971). The reduction of the EPS and REPS data resulted in the identification of these factors:

Factor One	Social Relationships
Factor Two	External Expectations
Factor Three	Social Welfare
Factor Four	Professional Advancement
Factor Five	Escape/Stimulation
Factor Six	Cognitive Interest.

In the 1984 NCES study, the single most important reason for enrollment was determined to be either to secure a new job or advance in a current job. Boshier agreed that the major factors to participation were: (1) job-related, (2) meeting new people and (3) beginning a new hobby.

Henry & Basile (1994) identified these significant variables:

Reasons for Participation	Deterrents to Participation
General interest	Distance (travel time) to class
Job-related	Mass transit services

Reasons for Participation	Deterrents to Participation
Meet new people	Parking
Hobby	Spare time
Major life changes in the last year	Child care, and
	Course fees.

Major deterrents to participation were identified by these researchers (Kerka (1986); Scanian (1986); Benshoff & Lewis (1992); Bauer and Mott (1990); and Terrell (1990):

Cost	Worth	Quality of educational opportunities
Lack of Motivation	Lack of self-confidence	Negative Perception/Value of Edu.
Family Concerns	Minimum free time	Incompatibilities of time &/or place
Relevance		

Scanlon & Darkenwald (1984) and Darkenwald & Valentine (1985) developed the Deterrents to Participation Scale and identified these factors:

Factor One	Lack of confidence
Factor Two	Time constraints
Factor Three	Cost
Factor Four	Lack of course relevance
Factor Five	Low Personal Priority
Factor Six	Personal Problems.

Darkenwald & Hayes (1988) through the AACES found that participation varied greatly among:

- Men and women;
- Individuals with different levels of education, and
- Individual with different levels of income.

They also identified three factors to participation:

Factor One	Enjoyment of learning activities
Factor Two	Importance of adult education
Factor Three	Intrinsic value of adult education.

In 1990 they identified the need for further research to include these demographics:

- Marital status
- Number of dependent children
- Occupation.

Hanson & DeMuth (1991) conducted research to study facilitators and barriers to participation by pharmacists. They identified 16 barriers and 12 facilitators based on prior research and noted the importance to include these demographics for further research:

- Employment
- Age
- Setting
- Positions.

Here is a comparison of the Hanson & DeMuth study to the data collected in this study:

	Pharmacists	**Blue-Collar Workers**
Usable Responses:	394	313
Response Rate:	51.2%	45%
Gender	65% male 35% female	88% male 12% female
Age	30-39 year range (36%)	Mean years: 48.2129
Level of Edu.	88% held B.S./B.A.	67% had completed high school/GED
Licensure	90% affected by licensure Requiring mandatory CE	25% skilled tradesmen which "could" require licensure

Top 4 Barriers:	**Ranked by Population**	**Participants**	**Non-Participants**
	(1) Job Constraints	**(1)** Job Constraints	**(1)** Low Priority
	(2) Scheduling	**(2)** Family Constraints	**(2)** Job Constraints
	(3) Family Constraints	**(3)** No Job Advan.	**(3)** No Job Advancement
	(4) Lack of Relevancy	**(4)** Low Priority	**(4)** Lack of Interest

	Pharmacists	**Blue-Collar Workers**	
Top 4 Facilitators:	Ranked by Population	Participants	Non-Participants
	(1) Personal Desire to Learn	**(1)** Personal Desire	**(1)** Ease of Convenience
	(2) Requirement/Licensure	**(2)** On-site Advisor	**(2)** On-site Advisor
	(3) Enjoyment/relaxation	**(3)** Enjoyment/Relax.	**(3)** Encourage/Family
	(4) Opportunity to Interact	**(4)** Ease of Conven.	**(4)** Financial Asst.

Significant Statistical Findings:

Chi-square testing of independence identified 16 of the 28 total variables which indicated a degree of dependence on participation:

Rankings in order of significance: Personal Desire; On-site Advisor; Ease of Convenience; Enjoyment/Relation; Opportunity to Interact; Lack of Interest; Negative Experience/LRC; Financial Assistance; Job Constraints; Scheduling of Learning Activities; Lack of Available/Desirable Courses; Encouragement from Company; Marital Status; Encouragement from Family; Gender; Lack of Confidence; and Requirement for Licensure.

Correlation statistical analyses of barriers to barriers; barriers to facilitators; and facilitators indicated no strong relationships were present in the data. Only intermediate relationships (approximately .50) were reported for these variables: **Barriers:** Lack of Confidence to Negative Experience/K-12 (.51); Negative Experience/K-12 to Negative Experience/Votech/College (.56); and Negative Experience/Votech/College to Negative Experience/LRC (.53). **Facilitators**: Personal Desire to Learn to Enjoyment, relaxation, change of pace and break from routine (.52); and Enjoyment, relaxation, change of pace and break from routine to Opportunity to meet and interact with others (.51).

These moderately correlated variables **do not suggest a cause and effect relationship**—only that they are moderately positively correlated, thereby showing an overall tendency as one variable increases in size, the other shows some systematic tendency to increase correspondingly in a uniform way.

No outliers were observed in the correlational analysis based on an examination of the standard deviations.

Overwhelmingly, the data showed little to moderate correlation in all three areas of barriers to barriers; barriers to facilitators; and facilitators to facilitators.

The factor analysis produced four factors from **barrier** variables and three factors from **facilitator** variables:

Barrier Variables

Named Factor	Derived From These Variables Ranked from High to Low Loadings
Negative	Negative experience/K-12; Negative experience/Votech/College; Negative experience/LRC; Lack of Confidence
Extrinsic Lacking	Lack of Recognition; Lack of Job Advancement; Lack of Information; Family Constraints
Intrinsic Lacking	Lack of interest; Low Personal Priority; Lack of Desired Courses Available; Lack of Learning Opportunities to Match Learning Style
Constraints	Scheduling Constraints (location/distance/time); Job Constraints (lack of relief help, time off, shift work, overtime); Family Constraints; Job-related Burnout.

Facilitator Variables

Named Factor	Derived From These Variables Ranked from High to Low Loadings
Extrinsic Encouragement	Encouragement from family; encouragement from Company; Job Advancement (opportunity for better income); Requirement for maintenance of licensure/tech. Skills;
Personal	Enjoyment/Relaxation/change of Pace from Routine; Opportunity to meet/Interact/Exchange ideas with others; Affordable learning opportunities/financial assistance
Motivator	Fear of Obsolescence/keeping up with technology; Ease of convenience; Assistance of on-site education advisor; Affordable learning opportunities/financial aid.

The sample size in this study was sufficiently adequate for the factor loadings resulting from the factor analysis. The "meritorious" level for the Kaiser rating confirmed sufficient sampling adequacy. Scree tests confirmed the correct number of factors retained for both barriers and facilitators were appropriate.

Discriminant function analysis identified six variates: Enjoyment/Relaxation; Encouragement from Family; Ease of Convenience; Family Constraints; Negative education experience at the K-12 level; and Lack of recognition for participation in learning activities. With a 75% - 25% split between number of subjects identifying themselves as participants and number of subjects identifying themselves as non-

participants, it could be said that we have a 75% chance of predicting membership correctly in the participants group and a 25% chance of predicting membership correctly in the non-participants group acting on chance alone. Subjects could be arbitrarily assigned to the larger group and achieve a 75% classification accuracy **without** conducting a DFA. Comparing the "hit ratio" of this study with 79% in the **validation sample** and a 78% in the **analysis sample** slightly improves our chances. However, using the proportional chance criterion calculated C_{pro} of 69% in the **validation** sample and a calculated C_{pro} of 66% in the **analysis** sample improves our prediction accuracy levels. Therefore, a prediction accuracy of 75% [79% in our **validation** sample and 78% in our **analysis** sample] is more significant because it is higher than the 69% (**validation**) or 66% (**analysis**) proportional chance criterion.

The "bottom line" here is that the DF predictors for correctly classifying a subject in a group is very good (79% based on DFA results) in the **validation** sample and (78% based on DFA results) in the **analysis** sample for **participants** but does not work well for **non-participants.** Percentages for participants alone were excellent (97% for both analysis and validation). It may well be that researchers have not yet identified those selection variables that would clearly distinguish group membership in the area of participation of adult education. In this study, little differentiation between the two centroids led to major overlapping making it very difficult to discriminate between the two groups. One reason may be that these particular workers, 75% of who perform basically the same kind of job, have held their current job classifications on the average of 14 years, worked for the same employer on average for over 20 years, experience the same kind of overtime requirements, have achieved about the same education level, are

approximately 48 years old, are married with most spouses either working fulltime or are unemployed outside the home, have no dependent children (on average), working approximately the same 5-day operation and on day shift simply are more alike than different. In other cases, where blue-collar workers are employed by various employers in non-union shops, performing a large variety of jobs, with differing educational backgrounds and ages, the differences may be quite different and this same study on different populations of blue-collar workers in other industrial/manufacturing environments may, indeed, render very different results and provide better predictors for group membership between participants and non-participants in adult education.

In the hypotheses section of Chapter 4, Data Analysis, major researchers in the field were confirmed in the following areas for blue-collar workers by way of rejecting the null hypotheses that there would be no significant differences with regard to mean scores for participants and non-participants in the barriers and facilitators section of the survey dealing with cognitive interest; escape/stimulus; negative prior education experiences/K-12; negative prior education experiences/Votech/College; and negative prior education experiences/LRC.

The data did not support researchers' theories, however, in these areas for blue-collar workers, by virtue of failure to reject the null hypotheses that there would be no significant differences with regard to mean scores for participants and non-participants, in the barriers and facilitators section of the survey regarding social relationships; external expectations/company; external expectations/family; social welfare; lack of information; lack of interest; low personal priority; family constraints; cost of learning; scheduling (location/distance/time); job-related burnout; no job advancement [barrier]; job

advancement with higher income potential [facilitator]; financial assistance; lack of confidence, and the Assistance of an on-site education advisor.

The researcher would suggest at this juncture that these participants and non-participants are more alike each other than they are different from each other.

The demographic section of the survey did significantly contribute to the knowledge base of descriptive profiles of the subjects:

Gender:	75% male to 25% female population
Age:	Mean age of 48.2 years indicates older, more mature work force
Education:	67% high school graduates or GED
Skilled/Unskilled:	25% Skilled Trades; 75% Production [non-skilled labor]
Marital Status:	85% Married; 15% Other
Spousal Education:	60% high school graduates or GED
Spousal Employment:	51% fulltime employed; 39% unemployed; and 10% part-time employed
No. Dependent Children:	39% have none; 21% have one; 22% have 2; 2% have more than 2
Level of Participation:	79 % participants and 21% non-participants—if you add in the 16% who have Not used their ETAP in six or more years, the result of non-participants would Rise to 37%
Weekly Overtime:	35% None; 1-10 hours 32%; 11-20 hours 27%; more than 24 hours 6% (based on this ndustry's slowest period experienced annually)
Work Status:	86% active workers; 13% TLO; 1% on medical leave
Building Location:	55% located in Float; 45% in FAB
Weekly Work Week:	67% on a 5-day operation; 33% on a 7-day operation
Current Shift:	62% working day shift [7a-3p]; 22% working graveyard [11p-7a] and 16% working afternoons [3p-11p]

Other group comparative demographic data include:

Participants Mean Age = 47.7 years;	Non-participants Mean Age = 49.3
Participants Mean Years in Current Job = 14.02	Non-participants MeanYears in Current Job = 15.09
Participants Mean Weekly Hours O.T. = 8.47	Non-participants Mean Weekly Hours O.T. = 6.22
Participants Mean No. Depend. Children = 1.37	Non-participants Mean No. Depend. Children = 1.24

Answers from the open-ended questions tended to validate quantitative survey results. Two new dimensions were added: Future plans to enroll in courses--to this question, a resounding 247 responded "no"--and how long it had been since workers attended school. The largest count fell into the 21-25 year category, followed in order by: 16-20 years; 26-30 years; 36-40 years; 6-10 years; and 31-35 years.

The subjects responded that their **greatest obstacles** were (in rank order):

Time constraints; Family constraints; O.T./Shift work; Age, Low Priority; and Lack of interest or Desire.

Variables cited as those **that would make it easier** for the workers to go-back-to-school (in rank order):

More free time; Fewer family responsibilities; Less O.T./Shift change stability in scheduling; Loss of job or impending layoff causing a change in priorities or conditions.

It should be noted that from a population of 690 employees, 313 responded to the survey used in this study resulting in a 45% response rate.

Recommendations for Modification of Survey Instrument:

Several things come to mind in terms of doing things differently if this research project were repeated. It appears some of the survey questions were not clear resulting in several questions being answered from different perspectives. Apparently some uncertainties existed in the minds of the respondents on exactly the type of information the survey was seeking. This was evidenced by differing answers regarding specificity of learning activities, learning opportunities, classes, courses, credit vs. non-credit, formal education vs. special programs, and job-related vs. personal enjoyment. More clarification from the researcher would have made the responses more enlightening if everyone had been "reading off the same page."

Even though the researcher tried to modify the Hanson & DeMuth survey instrument to properly address blue-collar worker issues rather than pharmacist issues, in

retrospect, some questions needed more simplifying for this less educated group, i.e., barrier question no. 29, addressing the issue of "Lack of learning opportunities to match your learning style," didn't seem to add value to this survey for industrial workers. Since barrier survey questions numbers 22, 24 and 26 were correlated, it appears that these questions did support the concept of internal instrument validity by providing cross validation (through the use of similar questions).

The demographic information relating to building location, weekly work schedule, current shift, and current job classification (this study identified 28 job classifications and 10 skilled trades represented in this work force), while meaningful to the employer of this particular work force, it did not supply useful data from which to compare to other research studies—even though these factors were considered as significant barriers by many of the respondents. Also of questionable value was the section of questions dealing with the spouse's level of education and employment and number of dependent children. Although it made for interesting reading, it was apparent that this study did not capitalize on the use of this information in terms of how this information affected worker participation in adult education activities. However, although these may seem of little value to this study, they do provide continuity between pharmacists and industrial workers, and the two studies.

Future Research

Although the DF produced "less than meritorious results" in terms of correctly classifying the non-participant group's membership (it did a very good job of predicting participants), far greater than would result by mere chance, perhaps the selected barriers and facilitators used in this study are not revealing the most distinctive factors which best

differentiate blue-collar worker participants from non-participants in adult education. This is an area to pursue for future research in the field. More studies need to be conducted on "special populations" to compare findings with other sub-populations, such as the blue-collar worker, the pharmacist, etc., in order to reap better results for generalizing results to the population at large. However, additional barrier and facilitator questions to supplement the 28 pharmacy study survey questions should be added to more clearly distinguish between the two groups.

Conclusions

When compared to the review of literature research results as a whole for participation factors in adult education, it appears nothing of major significance resulted from this study. The same "basic" deterrents/barriers and motivators/facilitators seemed to be the same for both participants and non-participants at this particular industrial site. This revelation isn't surprising when one stops to consider the Hanson & Demuth modified survey instrument used herein was framed from prior research literature in the field. Actually, two new dimensions were revealed. Those two ideas were found in the open-ended questions especially designed for this study and included at the end of the survey.

When examined closely and compared specifically to the pharmacists' study some differences between the two sub-populations did appear significant. In the pharmacists' study, the barrier, "no job advancement" did not score significantly among self-ratings, whereas, in the blue-collar worker survey, both participants and non-participants did rate this as a significant barrier.

The pharmacists rated the facilitator, "requirement for licensure" high on their list

(rated 2nd highest mean score) affecting 90% of their population, which is to be expected in their profession; while only approximately 25% of the blue-collar population in this study representing skilled tradesmen were inclined to rate that variable high. In the population responses, 30% rated "licensure" as "almost never" serving as a facilitator to their participation, 15% rated it "once in a while" and 36% indicated the question was not applicable—which, of course, it isn't to the production worker at large (representing 75% of the work force and of the survey respondents, as well).

Another significant difference was the pharmacists selecting "opportunity to interact" as high on their list of important facilitators. While the blue-collar worker did not rate this element high on their list, they did place a high degree of importance on having an on-site education advisor, financial assistance, encouragement from family and ease of convenience—which did not rate equally high with the pharmacists.

The use of the open-ended questions did result in one additional self-proclaimed obstacle that was not evaluated as a barrier in the pharmacist study: Age.

In terms of addressing the problem statement for this study, it is this researcher's opinion that important data does originate from conducting studies regarding levels of participation and non-participation on different sub-populations and these studies do give rise to a deeper level of understanding on participation factors in adult education as a whole. The results do reflect many reasons why, at least in this blue-collar sub-population, this very important segment of the U.S. population is falling behind other population segments seeking to participate in adult education activities. The results of this study do further reinforce the function that barriers and facilitators play in participation of adult education by adult non-traditional learners.

These findings support what one might expect to learn from such a study: These blue-collar workers are different in some ways from the general population and yet, at the same time, are alike in many ways.

If this knowledge could be put "to work" in the adult education arena, we could do a better job of creating a more user-friendly environment, develop better, more attractive educational programs, and better serve our non-traditional adult students—especially those adults who have been absent from the classroom for long periods of time, (15-25 years or more in many cases).

It was clear from reading the worker's answers to the open-ended questions that they look to their employer to help them make this transition back into the classroom and that the costs (while not monetary for these workers) are high in terms of job, family and time constraints.

Proponents of distance education opportunities might well be encouraged by the results of this study and other similar studies because time, location and scheduling constraints can be more flexible than often found in the traditional "course-on-the-campus" approach.

High paying jobs, experienced by the workers in this study, in this industrial environment require mostly manual labor. This lack of "required" technological expertise on the part of 75% of the plant population tends to make workers complacent with the status quo. In fact, a majority of workers readily responded in their own words that "only the impending threat of job loss or layoff" would motivate them to participate in adult education activities at this stage in their lives.

Although this employer and labor union organization provide the money for

educational opportunities for its workers, as long as overtime is experienced at a high level, then it becomes more attractive to work the overtime and postpone any thoughts of future education. Sadly, for workers and society in general, their allotted educational tuition goes unused in a system which workers must "use" their educational benefits each year or "lose" them. It is not surprising to note that "lack of job advancement" also plays an important role in terms of motivators to participation in learning activities. As mentioned above, in a "closed shop" unionized environment, seniority remains the primary selection criterion in "rising from the ranks" to better paying job classifications. If workers are paid well, can earn more money by working overtime, in lieu of taking classes—for which there is no increase in pay, promotion, or recognition for learning new skills, why should workers flock to the classrooms? Although the classes are paid for, the opportunity costs are high. Is taking time for school, when compared to loss of income and loss of time with family members worth the trade-off? Consequently, these workers have the "what's in it for me" question on their lips while working in an environment that does not encourage, promote, reward or recognize participation in adult education activities.

The loss of maintaining or increasing technical skills is great to the workers, whose average age in U. S. manufacturing environments is steadily increasing. The unskilled laborer/production worker, the dinosaur in today's high-tech industry, is working "quietly" away toward retirement. He/she sees the value of education for others—the young, their children and grandchildren, but must look first to putting "bread on the table" to support others in their educational efforts before upgrading and improving themselves. Many of these workers responded that they were looking forward

to going back-to-school only after retiring from the work force.

It is precisely this human element that will put these dinosaurs "out to pasture" sooner rather than later. Never-ending distractions and disincentives are fortifying the barriers that bar these workers from the classroom. They are being left behind in the technology race, and companies would rather "buy them out" in terms of offering them early retirement than spend the necessary funds on retraining much of the current work force.

What will become of our future generations who will experience low paying jobs without the necessary education to help them to compete for higher paying jobs?

Much is left to be done in terms of constructing a theory to uncover aspects of the 'human condition that affects educational participation.' Henry & Basile cited in 1994. This researcher would agree. Every study on each sub-population adds to the "bank of knowledge" to which educational leaders and researchers can draw to make necessary changes in adult education practices and welcome the dinosaurs of industrial settings back into the classroom.

When asked the importance of this study to society, Horrace Mann, in the Twelfth Annual Report to the Massachusetts State Board of Education in 1848 is cited: "Education, then, beyond all other devised of human origin, is the great equalizer of the conditions of men—the balance-wheel of the social machinery," (Baker, 1992).

When asked the importance of this study to the U.S. economy, Franklin D. Roosevelt in his message to Congress, January 11, 1944 seems relevant: "True individual freedom cannot exist without economic security and independence. People who are hungry and out-of-a-job are the stuff of which dictatorships are made." (Baker,

1992).

When asked the importance of this study regarding the human element, Benjamin Disraeli's speech in the House of Commons, June 15, 1874 can be cited: "Upon the education of the people of this country the fate of the country depends," and H. G. Wells, from *The Outline of History*, 1920: "Human history becomes more and more a race between education and catastrophe," (Baker, 1992).

Finally, when asked the importance this study has on the issue of education reform, this researcher would cite Lord Macaulay, in his speech on parliamentary reform, March 2, 1831: "Reform, that you may preserve," (Baker, 1992).

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APPENDIX A

A Survey of Barriers and Facilitators to Participation in Adult Education

Purpose: This is an **confidential** survey designed to help determine what causes some industrial workers to participate in adult education activities while others in "similar" circumstances do not participate.

Please take a few minutes to complete the survey and return it to me using the enclosed, self-addressed prepaid envelope.

Thanks for your help!

Demographic Information

For each of the items listed below, **please check the most appropriate response or provide information requested.**

1. Gender: _____ Male: _____ Female
2. Age: _____
3. What level of education have you achieved?

___ Did **not** complete high school ___ Associate Degree ___ Technical Cert./Trade School
___ Completed GED ___ Bachelor's Degree ___ Master's Degree
___ High school diploma ___ Other earned degrees (Explain)_____

4. Skilled tradesman? ___ No ___ Yes, if so, what trade_____
5. Years in current job/classification _____ Current classification (i.e., glass handler, etc.)_____
6. Total hours of **overtime worked** per week _____ **NONE**, 40 hours straight time_____
7. Marital status: ___ Single ___ Married ___ Divorced ___ Separated ___ Widowed
8. **If married**, indicate highest level of education attained by spouse:

___ Did **not** complete high school ___Associate Degree ___ Technical Cert./Trade School
___ Completed GED ___ Bachelor's Degree ___ Master's Degree
___ High School Diploma ___ Other earned degrees

(Explain)_____

9. **If married**, which of the following best describes spouse's employment:

___ Not employed outside the home ___ Employed, part-time ___ Employed, full-time

10. Number of dependent children (including step and/or foster children): _____
11. Regarding your tuition assistance program (ETAP), please indicate your use:

___Used during past 12 months ___Used during Past 1 to 5 years ____ Never Used

12. Are you currently on temporary lay-off status (TLO) at the plant?

_____ Yes _____ No _____ On Medical Leave

Barriers to Learning

Listed below are 16 general factors which may serve as potential barriers to your learning process. For each sentence please indicate **by circling a number** from the corresponding five-point scale, the extent to which that factor might have served as a barrier to your participation in adult education.

1 - Never
2 - Almost Never
3 - Once in a While
4 - Frequently
5 - Almost Always

11. Lack of confidence (i.e., fear of something new, doubts regarding the ability to learn, expected difficulty of learning encounter, etc.)	1 2 3 4 5
12. Lack of interest in learning opportunities known to be available.	1 2 3 4 5
13. Job constraints (lack of relief help, time off, shift work, overtime)	1 2 3 4 5
14. Low personal priority of learning in relation to other activities	1 2 3 4 5
15. Cost of participation in learning	1 2 3 4 5
16. Family constraints (i.e., spouse, children, personal)	1 2 3 4 5
17. Negative experience with prior learning in relation to other activities	1 2 3 4 5
18. Scheduling (location/distance/time) of group learning activities	1 2 3 4 5
19. Negative experience with prior learning at the votech/college level	1 2 3 4 5
20. Lack of quality of learning activities	1 2 3 4 5
21. Negative experience with prior learning within the Learning Resource Center	1 2 3 4 5
22. Job-related burnout	1 2 3 4 5
23. Lack of job advancement opportunities from participating in learning activities	1 2 3 4 5
24. Lack of learning opportunities to match your learning style	1 2 3 4 5
25. Lack of recognition for participating in learning activities	1 2 3 4 5
26. Lack of information about available learning opportunities	1 2 3 4 5

Facilitators to Learning

Listed below are 12 general factors which may serve as potential facilitators to your learning process. For each sentence please indicate **by circling a number** from the corresponding scale, the extent to which that factor might have served as a facilitator to your participation in adult education.

1 - Never
2 - Almost Never
3 - Once in a While
4 - Frequently
5 - Almost Always

27. Personal desire to learn (i.e., intellectual interest)	1 2 3 4 5
28. Enjoyment/relaxation provided by learning as change of pace from the "routine"	1 2 3 4 5
29. Opportunity to meet/interact/exchange ideas with others	1 2 3 4 5
30. Requirement for maintenance of professional licensure or technical skills	1 2 3 4 5
31. Encouragement from an external source (i.e., employer)	1 2 3 4 5
32. Encouragement from family	1 2 3 4 5
33. Opportunity to increase recognition from and ability to serve community	1 2 3 4 5
34. Job advancement with potential for better income	1 2 3 4 5
35. Ease of convenience to learning opportunities	1 2 3 4 5
36. Fear of obsolescence, keeping up with technology	1 2 3 4 5
37. Affordable learning opportunities/financial assistance	1 2 3 4 5
38. Assistance of an on-site counselor to offer advice relative to learning opportunities/issues/problems	1 2 3 4 5

39. What are the **greatest obstacles** you face that keep you from going back-to-school? (Explain)

_____

_____

40. What would make it **easier** for you to go back-to-school? (Explain)

_____

_____

41. How long has it been since you attended school (i.e., high school, college, votech) ___months ___ years

Name or Type of school: _____Course:_____

42. What would motivate you the most to "go back-to-school"? (Explain)

_____

_____

43. Have you made plans to take a votech class, attend a workshop or seminar to learn a new skill or trade (i.e., learn new machine skill; learn to operate a computer; take welding short course, etc.)?

Yes____No____ If Yes, please describe:_____

_____

Thanks again for your valuable assistance

APPENDIX B

June 12, 1997

Dear

Re: **Ph.D. Research Survey of Barriers and Facilitators to Participation in Adult Education**

As you know, I have worked with you for the past six years at our local plant site. When you ratified your new union contract last September, one of the changes you adopted was the phase out of my job as your educational advisor. Soon I will be replaced by a union appointed education training coordinator. Consequently, I am turning my attention toward completing my Ph.D. degree at The University of Oklahoma in Adult and Higher Education, and **I need your help**.

A partial requirement for my degree is to complete a research project, and I have chosen to study participation factors in adult education experienced by industrial workers. I have completed all my classes and course work. The enclosed survey is like my "final exam." In order for me to complete my research project and my degree, **I need your completed survey** to help me discover those things that help you and your co-workers participate in adult education and those things which present obstacles for you and may keep you from participating. **I must receive a large percentage of surveys in order for my research to be valid...otherwise, I can't complete my degree. Also, I am paying for the postage for mailing this survey to your home at my own expense. Please help make it money well spent.**

I am committed to helping industrial workers, like you, take advantage of educational opportunities. With your help more can be learned about your motivations toward learning and the problems you face as you return to the classroom.

I use an identifying "Survey No.___" on the survey cover to avoid sending reminder letters to those who have already returned their survey. This number will not be used in any way to identify you. **Your identity will be kept strictly confidential.**

Your response is very important to me. Please take the time necessary to fill out this questionnaire and return it to me in the self-addressed, stamped envelope. **I need to receive your form within the next two weeks, if possible, while I am still at the plant and can answer any questions you might have about my survey**.

Thank you for the support you have given me over the past six years--you truly have touched my life. **Now you can help me** complete this degree so that I can continue to help people, like you, who want to 'return to learning.'

Sincerely yours,

APPENDIX C

July 18. 1997

Dear

Ph.D. Research Survey of Barriers and Facilitators to Participation in Adult Education

I know the survey I sent you on June 13. 1997. may have come at a busy time or caught you on vacation.

Perhaps. given the current mail delivery service. you may have not even received my original letter with the survey enclosed.

That's why I am sending you this reminder with a duplicate copy of my survey.

If you recall from my first letter. I announced that with the phase out of my job as your educational advisor. I must turn my attention toward completing my Ph.D. degree at The University of Oklahoma in Adult and higher Education to help me find another job. and **I must have your help to succeed**.

In order for me to complete my degree. I must conduct a major research study and I have chosen to study participation factors in adult education experienced by industrial workers. The enclosed survey will help me discover those things which present obstacles for you and may keep you from participating **(barriers)** in adult education activities and determine those things that may help you participate **(facilitators)** in adult education activities.

I must receive your completed survey for my research to be valid. Otherwise, I can't complete my degree. To date, I have received only a small fraction of the 700 surveys I mailed to worker's homes.

Please help me by taking the time to fill out this questionnaire and return it to me. I have placed a large file in the slot on my office door. located in the Learning Resource Center. for workers to drop off their surveys at their convenience. In my first mailing. I enclosed a self-addressed. stamped envelope for ease of reply—which I paid for at my own expense. Unfortunately. most of that postage was wasted. so I am now asking that you stop by the Learning Resource Center to drop off the survey and save me any additional expenses in collecting this data.

Your response is very important to me. I need to receive your completed survey by August 1st while I am still at the plant and can answer any questions you might have about my research study.

Thank you for your continued support. I will miss my many friends at the plant. With your help, I can complete this degree and continue to help others, like you, who want to "return to learning."

Sincerely yours.

APPENDIX D

Table 1 – Basic Survey Statistics

Survey No.	N	Frequency	Percent	Mean	Std. Dev
#D-1 (Gender)	312			N/A	N/A
Male		275	88.1		
Females		37	11.9		
#D-2 (Age)	310			48.21	7.92
30<		2	.6		
30-39		46	14.7		
40-49		122	39.2		
50-59		110	35.4		
60-69		29	9.3		
70		1	.3		
#D-3 Education	311			N/A	N/A
H.S./Not Fin.		15	4.8		
GED		24	7.7		
H.S. Diploma		183	58.8		
Trade Cert.		29	9.3		
Assoc Degree		32	10.3		
B.S./B.A.		22	7.1		
M.S./M.A.		6	1.9		
#D-4 (Class)	294			N/A	N/A
Skilled Trade		75	25.5		
Production		219	74.5		
#D-5	300			14.31	7.20
Years in Job					
1-10		108	36.0		
11-20		133	44.3		
21-30		56	18.7		
31-38		3	.9		
#D-6 Weekly O.T.	292			N/A	N/A
None		103	35.3		
1-10 Hrs		93	31.8		
11-20 Hrs		80	27.3		
24+ Hrs		16	5.5		
#D-7	312			N/A	N/A
Married		365	84.9		
Other		47	15.1		
#D-8 (Spouse)	267			N/A	N/A
H.S./Not Fin.		16	6.0		
GED		13	4.9		
H.S. Diploma		147	55.1		
Trade/Cert.		22	8.2		
Associate Degree		32	12.0		
B.S./B.A.		26	9.7		
M.S./M.A.		11	4.1		
#D-9(Spouse)	265			N/A	N/A
Unemployed		102	38.5		
Part-time		27	10.2		
Fulltime		136	51.3		

Survey No.	N	Frequency	Percent	Mean	Std. Dev.
#D-10 Children	290			N/A	N/A
None		113	39.0		
One		62	21.4		
Two		65	22.4		
>2		50	17.2		
#D11 (ETAP)	307			2.45	.96
Last 12 Mo's (P1)		40	13.0		
1-5 Past Yrs (P2)		152	49.5		
Past 6+ Yrs (P3)		50	16.3		
NEVER (NP)		65	21.2		
#D-12 (TLO)	313			1.88	.35
TLO (Yes)		40	12.8		
Active (No)		269	85.9		
On Medical		4	1.3		
#D-13 Work Site	301			N/A	N/A
Float		164	54.5		
FAB		137	45.5		
#D-14 (Work Schedule)	309			N/A	N/A
5 Day Opera.		208	67.3		
7 Day Opera.		101	32.7		
#D-15 (Shift)	300			N/A	N/A
One (11p-7a)		65	21.67		
Two (7a-3p)		187	62.33		
Three(3-11p)		48	16.00		
#B-16	309			1.83	1.06
1		155	50.2		
2		89	28.8		
3		34	11.0		
4		22	7.1		
5		9	2.9		
#B-17	311			2.60	1.16
1		61	19.6		
2		101	32.5		
3		62	19.9		
4		75	24.1		
5		12	3.9		
#B-18	312			3.19	1.39
1		50	16.0		
2		61	19.6		
3		46	14.7		
4		88	28.2		
5		67	21.5		
#B-19	312			2.87	1.32
1		60	19.2		
2		77	24.7		
3		55	17.6		
4		81	26.0		
5		39	12.5		

Survey No.	N	Frequency	Percent	Mean	Std. Dev.
#B-20	310			1.80	1.04
1		178	57.4		
2		34	11.0		
3		83	26.8		
4		10	3.2		
5		5	1.6		
#B-21	311			2.97	1.41
1		73	23.5		
2		49	15.8		
3		48	15.4		
4		94	30.2		
5		47	15.1		
#B-22	312			1.80	1.11
1		185	59.3		
2		38	12.2		
3		66	21.2		
4		12	3.8		
5		11	3.5		
#B-23	309			2.80	1.38
1		67	21.7		
2		85	27.5		
3		44	14.2		
4		68	22.0		
5		45	14.6		
#B-24	312			1.82	1.01
1		175	56.1		
2		33	10.6		
3		91	29.2		
4		10	3.2		
5		3	1.0		
#B-25	311			2.37	1.22
1		97	31.2		
2		85	27.3		
3		59	19.0		
4		55	17.7		
5		15	4.8		
#B-26	309			1.65	.95
1		202	65.4		
2		23	7.4		
3		74	23.9		
4		10	3.2		
5		-0-	-0-		
#B-27	311			2.39	1.27
1		101	32.5		
2		77	24.8		
3		64	20.6		
4		47	15.1		
5		22	7.1		

Survey No.	N	Frequency	Percent	Mean	Std. Dev.
#B-29	310			2.17	1.11
1		110	35.5		
2		85	27.4		
3		74	23.9		
4		32	10.3		
5		9	2.9		
#B-30	311			2.05	1.14
1		148	47.6		
2		34	10.9		
3		105	33.8		
4		12	3.9		
5		12	3.9		
#B-31	311			1.81	1.06
1		175	56.3		
2		47	15.1		
3		68	21.9		
4		14	4.5		
5		7	2.3		
#F-32	310			3.26	1.32
1		29	9.4		
2		86	27.7		
3		38	12.3		
4		89	28.7		
5		68	21.9		
#F-33	308			2.95	1.31
1		50	16.2		
2		80	26.0		
3		53	17.2		
4		84	27.3		
5		41	13.3		
#F-34	309			2.74	1.27
1		61	19.7		
2		89	28.8		
3		56	18.1		
4		74	23.9		
5		29	9.4		
#F-35	307			2.50	1.21
1		91	29.6		
2		47	15.3		
3		111	36.2		
4		38	12.4		
5		20	6.5		
#F-36	310			2.31	1.27
1		109	35.2		
2		79	25.5		
3		61	19.7		
4		38	12.3		
5		23	7.4		

Survey No.	N	Frequency	Percent	Mean	Std. Dev.
F-37	310			2.82	1.27
1		61	19.7		
2		80	25.8		
3		61	19.7		
4		69	22.3		
5		39	12.6		
F-38	308			2.32	1.14
1		97	31.5		
2		73	23.7		
3		93	30.2		
4		32	10.4		
5		13	4.2		
#F-39	310			2.53	1.39
1		112	36.1		
2		36	11.6		
3		82	26.5		
4		44	14.2		
5		36	11.6		
#F-40	309			3.11	1.30
1		42	13.6		
2		73	23.6		
3		48	15.5		
4		98	31.7		
5		48	15.5		
#F-41	310			2.59	1.31
1		84	27.1		
2		76	24.5		
3		56	18.1		
4		69	22.3		
5		25	8.1		
#F-42	308			2.84	1.45
1		85	27.6		
2		47	15.3		
3		58	18.8		
4		67	21.8		
5		51	16.6		
#F-43	306			3.22	1.42
1		55	18.0		
2		45	14.7		
3		52	17.0		
4		83	27.1		
5		71	23.2		

June 6, 1997

Professor Alan L. Hanson
University of Wisconsin - Madison
School of Pharmacy
425 North Charter Street
Madison, Wisconsin 53706

Dear Professor Hanson:

Re: Permission Request

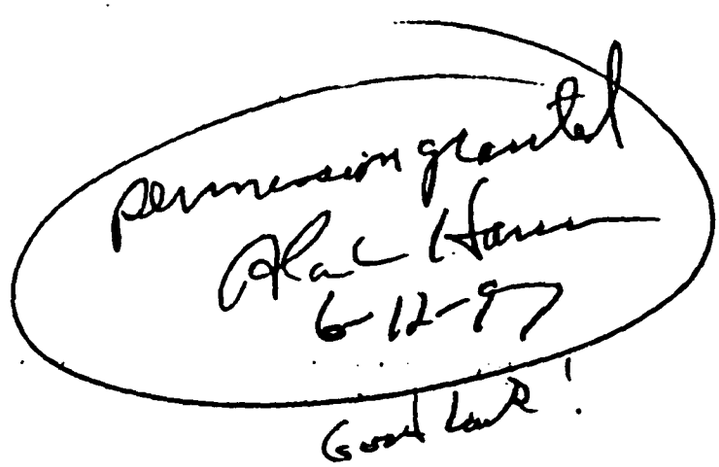
I have reviewed the survey you used for the Extension Services in Pharmacy at the School of Pharmacy of the University of Wisconsin to examine a variety of factors relating to lifelong learning in 1989.

I am launching a study of blue-collar workers to determine both barriers and facilitators to learning and am requesting your permission to use a modified version of your survey instrument.

Dr. Robert Fox of the University of Oklahoma is on my dissertation committee and he suggested that I contact you regarding my request.

I appreciate your consideration in this matter.

Sincerely yours.



APPENDIX F

Computer Generated Factor Analysis/Barriers Data

Initial Factor Method: Principal Components

Partial Correlations Controlling all other Variables

	B16	B17	B18	B19	B20	B21
B16	1.00000	0.03422	-0.03410	0.04164	0.00546	-0.05411
B17	0.03422	1.00000	-0.00667	0.28479	-0.08060	-0.10935
B18	-0.03410	-0.00667	1.00000	-0.01772	-0.04145	0.13711
B19	0.04164	0.28479	-0.01772	1.00000	0.04057	0.16817
B20	0.00546	-0.08060	-0.04145	0.04057	1.00000	0.03243
B21	-0.05411	-0.10935	0.13711	0.16817	0.03243	1.00000
B22	0.39726	0.04935	0.00791	-0.03283	0.04213	-0.02629
B23	-0.00190	-0.04404	0.28615	0.05410	0.06377	0.07547
B24	-0.04666	-0.05705	0.05136	0.02019	0.13740	-0.04811
B25	0.06203	0.09968	-0.01814	0.10971	0.02431	-0.06754
B26	0.02159	-0.00705	-0.12466	-0.00720	0.04665	0.01905
B27	0.02621	0.03998	0.08694	0.03273	0.00683	0.09114
B28	0.03226	0.07901	0.12813	-0.01535	0.02603	0.01399
B29	-0.01896	0.11341	0.08844	0.09082	0.10400	-0.00740
B30	-0.01921	0.09430	-0.04445	-0.07150	0.06350	0.12962
B31	0.09401	0.06076	0.07127	-0.00081	0.29710	0.07046

	B22	B23	B24	B25	B26	B27
B16	0.39726	-0.00190	-0.04666	0.06203	0.02159	0.02621
B17	0.04935	-0.04404	-0.05705	0.09968	-0.00705	0.03998
B18	0.00791	0.28615	0.05136	-0.01814	-0.12466	0.08694
B19	-0.03283	0.05410	0.02019	0.10971	-0.00720	0.03273
B20	0.04213	0.06377	0.13740	0.02431	0.04665	0.00683
B21	-0.02629	0.07547	-0.04811	-0.06754	0.01905	0.09114
B22	1.00000	0.01283	0.41998	-0.02558	0.06759	0.12840
B23	0.01283	1.00000	0.03302	0.19444	0.02552	0.06739
B24	0.41998	0.03302	1.00000	0.00027	0.33126	0.04661
B25	-0.02558	0.19444	0.00027	1.00000	0.07050	0.03855
B26	0.06759	0.02552	0.33126	0.07050	1.00000	-0.01762
B27	0.12840	0.06739	0.04661	0.03855	-0.01762	1.00000
B28	-0.08142	0.02213	0.00581	-0.09708	0.02498	0.19817
B29	0.15336	0.01636	-0.04587	0.15232	0.08354	0.05856
B30	-0.09867	-0.01060	0.16557	0.13387	0.09641	0.06609
B31	0.06743	-0.05621	-0.13615	-0.05550	0.23520	0.15163

	B28	B29	B30	B31
B16	0.03226	-0.01896	-0.01921	0.09401
B17	0.07901	0.11341	0.09430	0.06076
B18	0.12813	0.08844	-0.04445	0.07127
B19	-0.01535	0.09082	-0.07150	-0.00081
B20	0.02603	0.10400	0.06350	0.29710
B21	0.01399	-0.00740	0.12962	0.07046
B22	-0.08142	0.15336	-0.09867	0.06743
B23	0.02213	0.01636	-0.01060	-0.05621
B24	0.00581	-0.04587	0.16557	-0.13615
B25	-0.09708	0.15232	0.13387	-0.05550
B26	0.02498	0.08354	0.09641	0.23520
B27	0.19817	0.05856	0.06609	0.15163
B28	1.00000	0.05121	0.21043	-0.06167
B29	0.05121	1.00000	0.16344	0.10004
B30	0.21043	0.16344	1.00000	0.17548
B31	-0.06167	0.10004	0.17548	1.00000

Initial Factor Method: Principal Components

Kaiser's Measure of Sampling Adequacy: Over-all MSA = 0.82269721

B16	B17	B18	B19	B20	B21
0.802419	0.757067	0.681127	0.739506	0.887194	0.729915

B22	B23	B24	B25	B26	B27
0.780052	0.762750	0.780785	0.819745	0.866799	0.904120

B28	B29	B30	B31
0.764089	0.904981	0.854924	0.835119

Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 16 Average = 1

	1	2	3	4
Eigenvalue	4.3802	1.5933	1.2879	1.1274
Difference	2.7869	0.3054	0.1605	0.1368
Proportion	0.2738	0.0996	0.0805	0.0705
Cumulative	0.2738	0.3733	0.4538	0.5243

	5	6	7	8
Eigenvalue	0.9906	0.9392	0.7847	0.7197
Difference	0.0514	0.1545	0.0650	0.0496
Proportion	0.0619	0.0587	0.0490	0.0450
Cumulative	0.5862	0.6449	0.6940	0.7389

	9	10	11	12
Eigenvalue	0.6701	0.6339	0.6032	0.5502
Difference	0.0362	0.0307	0.0530	0.0142
Proportion	0.0419	0.0396	0.0377	0.0344
Cumulative	0.7808	0.8204	0.8581	0.8925

	13	14	15	16
Eigenvalue	0.5361	0.4968	0.3863	0.3004
Difference	0.0392	0.1105	0.0860	
Proportion	0.0335	0.0311	0.0241	0.0188
Cumulative	0.9260	0.9571	0.9812	1.0000

4 factors will be retained by the NFACTOR criterion.

Initial Factor Method: Principal Components

Eigenvectors

	1	2	3	4
B16	0.22909	-0.29891	0.09201	0.26808
B17	0.17549	0.10216	0.58786	-0.14795
B18	0.12692	0.45112	-0.23840	0.35597
B19	0.16190	0.21381	0.50615	0.03530
B20	0.29324	-0.09073	-0.16432	-0.13546
B21	0.12542	0.38119	-0.23052	-0.11977
B22	0.31493	-0.33390	-0.05345	0.28031
B23	0.17119	0.34161	-0.09479	0.52902
B24	0.30465	-0.27476	-0.18173	0.16290
B25	0.20920	0.08207	0.36510	0.22603
B26	0.31782	-0.24417	-0.10009	-0.08782
B27	0.28870	0.15858	-0.10129	-0.03565
B28	0.16880	0.29566	-0.14460	-0.30773
B29	0.31965	0.06437	0.14509	-0.07613
B30	0.30368	0.09101	-0.05793	-0.36407
B31	0.31679	-0.04927	-0.09507	-0.25983

Factor Pattern

	FACTOR1	FACTOR2	FACTOR3	FACTOR4
B16	0.47947	-0.37730	0.10442	0.28465
B17	0.36729	0.12896	0.66713	-0.15709
B18	0.26562	0.56943	-0.27054	0.37796
B19	0.33885	0.26988	0.57441	0.03748
B20	0.61372	-0.11452	-0.18647	-0.14383
B21	0.26248	0.48116	-0.26160	-0.12717
B22	0.65912	-0.42147	-0.06065	0.29763
B23	0.35828	0.43120	-0.10758	0.56170
B24	0.63761	-0.34682	-0.20624	0.17297
B25	0.43782	0.10359	0.41433	0.23999
B26	0.66516	-0.30821	-0.11359	-0.09324
B27	0.60422	0.20017	-0.11495	-0.03785
B28	0.35328	0.37320	-0.16409	-0.32674
B29	0.66899	0.08126	0.16466	-0.08083
B30	0.63557	0.11488	-0.06574	-0.38656
B31	0.66301	-0.06220	-0.10789	-0.27589

Variance explained by each factor

FACTOR1	FACTOR2	FACTOR3	FACTOR4
4.380159	1.593287	1.287887	1.127380

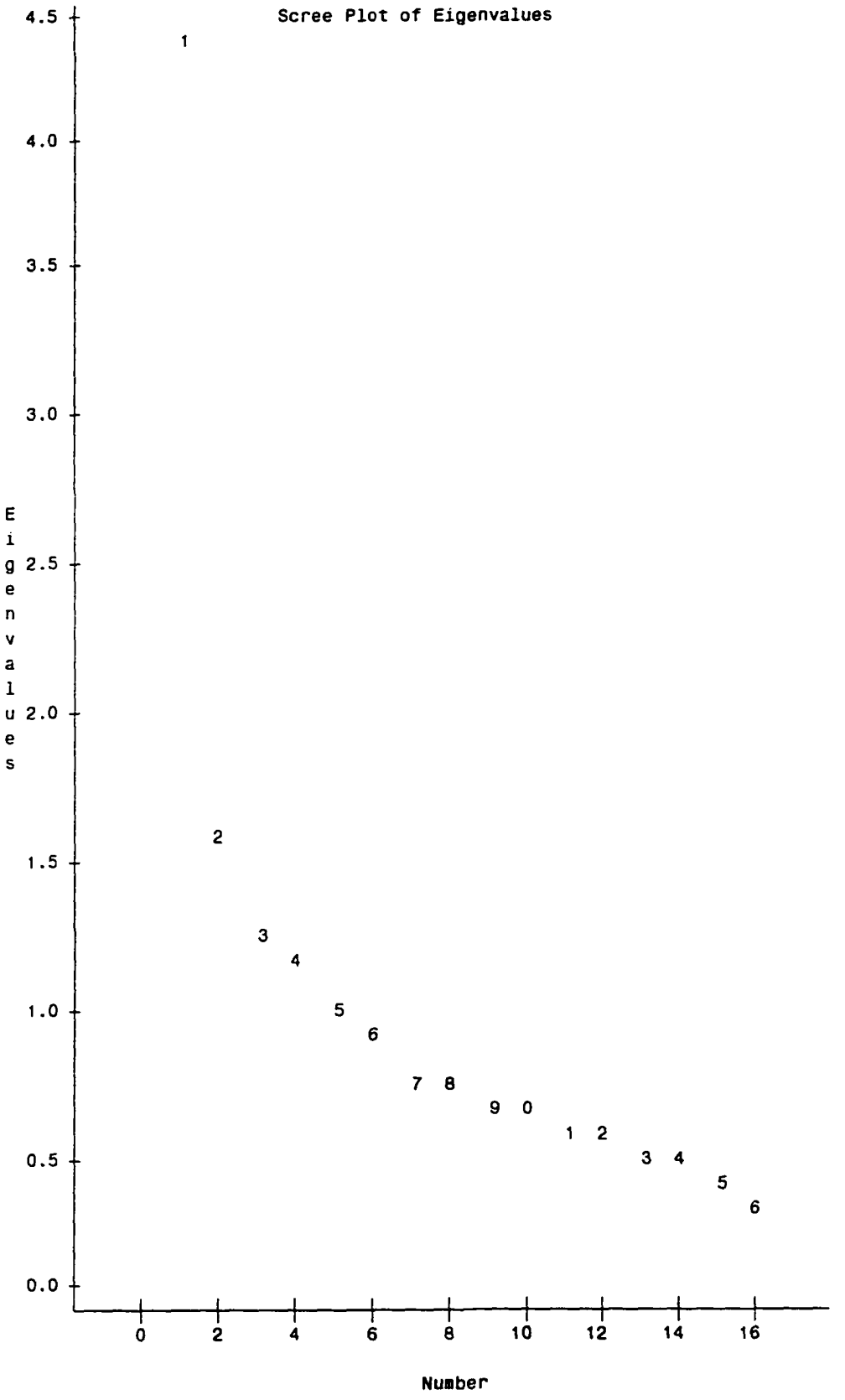
Final Communality Estimates: Total = 8.388713

B16	B17	B18	B19	B20	B21
0.464174	0.621270	0.610853	0.518999	0.445231	0.385022

B22	B23	B24	B25	B26	B27
0.704334	0.641374	0.599276	0.431682	0.559032	0.419799

B28	B29	B30	B31
0.397770	0.487800	0.570898	0.531199

Initial Factor Method: Principal Components



Rotation Method: Varimax

Orthogonal Transformation Matrix

	1	2	3	4
1	0.70528	0.56188	0.37206	0.22011
2	-0.62789	0.38677	0.23059	0.63481
3	-0.14341	-0.30399	0.89831	-0.28294
4	0.29625	-0.66505	0.03783	0.68448

Rotated Factor Pattern

	FACTOR1	FACTOR2	FACTOR3	FACTOR4
B16	0.64442	-0.09758	0.19596	0.03131
B17	0.03586	0.15792	0.75974	-0.13358
B18	-0.01943	0.20037	0.00140	0.75520
B19	-0.00174	0.09523	0.70572	0.10904
B20	0.48889	0.45288	0.02898	0.01670
B21	-0.11715	0.49768	-0.03120	0.35019
B22	0.82637	0.02784	0.10482	0.09841
B23	0.16378	0.02723	0.15734	0.76750
B24	0.74827	0.17178	-0.02147	0.09692
B25	0.25543	0.00051	0.56806	0.20917
B26	0.65131	0.35108	0.07084	-0.08093
B27	0.30573	0.47704	0.16627	0.26668
B28	-0.05844	0.61003	0.05773	0.13745
B29	0.37325	0.41102	0.41250	0.09692
B30	0.27103	0.67861	0.18928	-0.03317
B31	0.44040	0.56475	0.12498	-0.05186

Variance explained by each factor

FACTOR1	FACTOR2	FACTOR3	FACTOR4
2.932360	2.238833	1.731950	1.485571

Final Communality Estimates: Total = 8.388713

B16	B17	B18	B19	B20	B21
0.464174	0.621270	0.610853	0.518999	0.445231	0.385022

B22	B23	B24	B25	B26	B27
0.704334	0.641374	0.599276	0.431682	0.559032	0.419799

B28	B29	B30	B31
0.397770	0.487800	0.570898	0.531

APPENDIX G

Computer Generated Factor Analysis/Facilitators Data

Initial Factor Method: Principal Components

Partial Correlations Controlling all other Variables

	F32	F33	F34	F35	F36	F37
F32	1.00000	0.40529	0.05915	-0.01399	-0.06309	0.10023
F33	0.40529	1.00000	0.31508	0.04014	0.13176	-0.08451
F34	0.05915	0.31508	1.00000	0.03101	0.00969	0.04301
F35	-0.01399	0.04014	0.03101	1.00000	0.17071	0.19245
F36	-0.06309	0.13176	0.00969	0.17071	1.00000	0.20783
F37	0.10023	-0.08451	0.04301	0.19245	0.20783	1.00000
F38	-0.05572	0.04808	0.21474	0.05259	0.02855	0.24357
F39	0.08958	-0.02225	-0.02411	0.10449	0.19122	0.09226
F40	0.01026	0.09531	0.05905	-0.03777	0.06877	0.11782
F41	-0.09143	0.11339	-0.01532	0.11946	0.06960	-0.16131
F42	0.16338	0.04644	0.12619	0.01276	-0.04432	0.14695
F43	0.03803	-0.00211	0.09947	0.04818	-0.00825	0.00455

	F38	F39	F40	F41	F42	F43
F32	-0.05572	0.08958	0.01026	-0.09143	0.16338	0.03803
F33	0.04808	-0.02225	0.09531	0.11339	0.04644	-0.00211
F34	0.21474	-0.02411	0.05905	-0.01532	0.12619	0.09947
F35	0.05259	0.10449	-0.03777	0.11946	0.01276	0.04818
F36	0.02855	0.19122	0.06877	0.06960	-0.04432	-0.00825
F37	0.24357	0.09226	0.11782	-0.16131	0.14695	0.00455
F38	1.00000	0.18678	-0.08517	0.01378	0.00149	0.08754
F39	0.18678	1.00000	0.12137	0.11268	-0.06395	0.09004
F40	-0.08517	0.12137	1.00000	0.11707	-0.05430	0.25700
F41	0.01378	0.11268	0.11707	1.00000	0.26432	0.00028
F42	0.00149	-0.06395	-0.05430	0.26432	1.00000	0.32878
F43	0.08754	0.09004	0.25700	0.00028	0.32878	1.00000

Kaiser's Measure of Sampling Adequacy: Over-all MSA = 0.82592592

F32	F33	F34	F35	F36	F37
0.788240	0.788905	0.864897	0.879572	0.846612	0.810010

F38	F39	F40	F41	F42	F43
0.841234	0.860047	0.837160	0.748195	0.803659	0.840511

Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 12 Average = 1

	1	2	3	4
Eigenvalue	4.0094	1.3414	1.0491	0.8772
Difference	2.6680	0.2923	0.1718	0.0149
Proportion	0.3341	0.1118	0.0874	0.0731
Cumulative	0.3341	0.4459	0.5333	0.6064

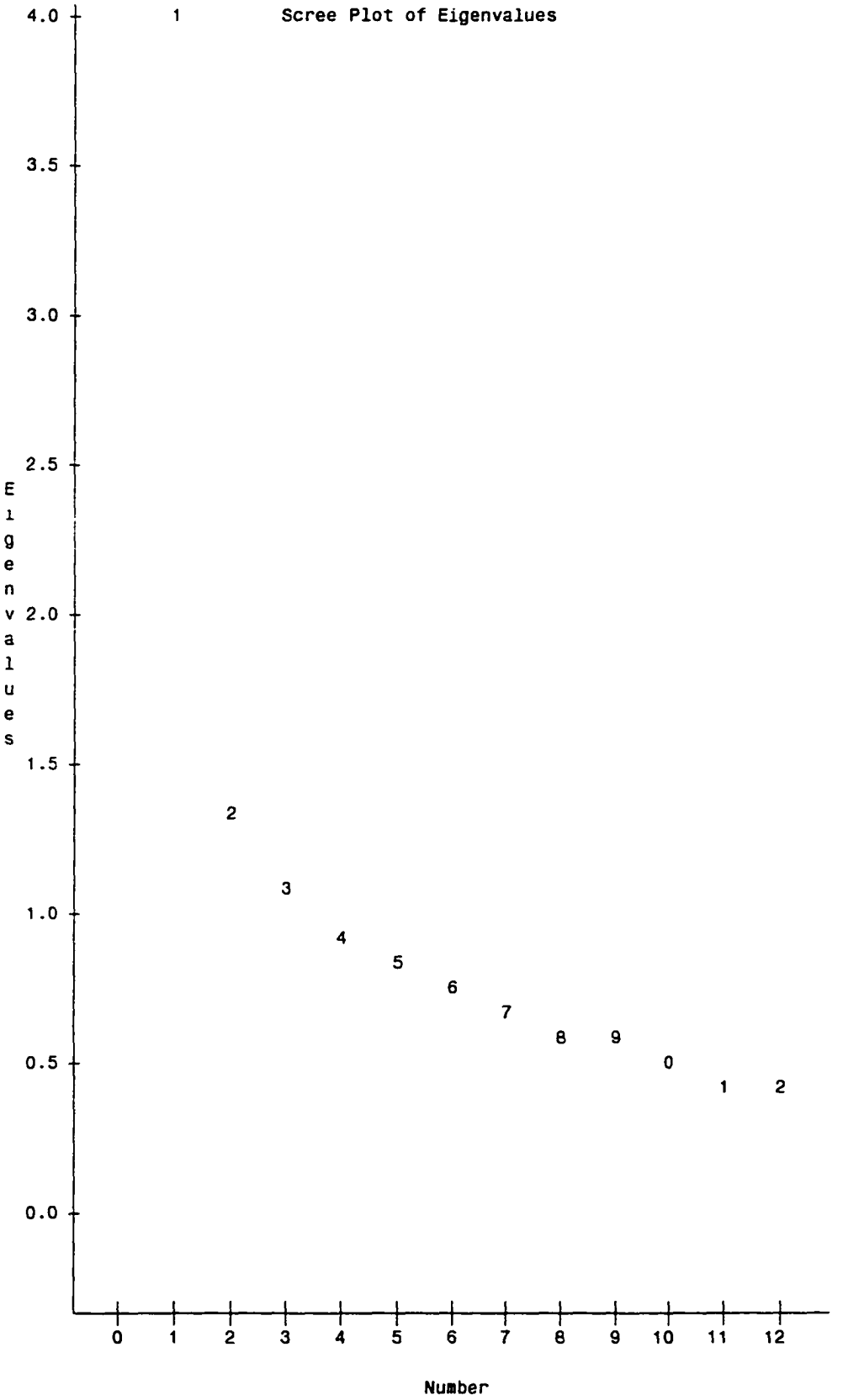
	5	6	7	8
Eigenvalue	0.8623	0.7430	0.6733	0.6177
Difference	0.1194	0.0696	0.0556	0.0457
Proportion	0.0719	0.0619	0.0561	0.0515
Cumulative	0.6783	0.7402	0.7963	0.8478

Initial Factor Method: Principal Components

	9	10	11	12
Eigenvalue	0.5720	0.4790	0.3990	0.3766
Difference	0.0930	0.0800	0.0224	
Proportion	0.0477	0.0399	0.0333	0.0314
Cumulative	0.8954	0.9354	0.9686	1.0000

3 factors will be retained by the NFACTOR criterion.

Initial Factor Method: Principal Components



Initial Factor Method: Principal Components

Eigenvectors

	1	2	3
F32	0.27741	-0.36933	-0.34355
F33	0.32570	-0.33656	-0.20112
F34	0.33055	-0.22107	-0.25526
F35	0.26491	0.34240	0.06288
F36	0.26997	0.39575	0.04291
F37	0.29915	0.34209	-0.26158
F38	0.28748	0.24453	-0.26787
F39	0.28459	0.33920	0.11270
F40	0.26320	-0.03917	0.31509
F41	0.21257	-0.11619	0.67186
F42	0.30902	-0.30747	0.16132
F43	0.31869	-0.16173	0.20249

Factor Pattern

	FACTOR1	FACTOR2	FACTOR3
F32	0.55547	-0.42774	-0.35187
F33	0.65217	-0.38979	-0.20600
F34	0.66187	-0.25603	-0.26145
F35	0.53044	0.39656	0.06440
F36	0.54057	0.45834	0.04395
F37	0.59900	0.39619	-0.26792
F38	0.57563	0.28321	-0.27436
F39	0.56985	0.39285	0.11543
F40	0.52701	-0.04537	0.32272
F41	0.42564	-0.13457	0.68814
F42	0.61876	-0.35610	0.16523
F43	0.63812	-0.18731	0.20739

Variance explained by each factor

FACTOR1	FACTOR2	FACTOR3
4.009380	1.341356	1.049063

Final Communality Estimates: Total = 6.399800

F32	F33	F34	F35	F36	F37
0.615321	0.619700	0.571980	0.442777	0.504224	0.587547

F38	F39	F40	F41	F42	F43
0.486828	0.492389	0.383947	0.672816	0.536975	0.485295

Rotation Method: Varimax

Orthogonal Transformation Matrix

	1	2	3
1	0.62720	0.62689	0.46220
2	0.76464	-0.60847	-0.21233
3	-0.14813	-0.48659	0.86098

Rotated Factor Pattern

	FACTOR1	FACTOR2	FACTOR3
F32	0.07344	0.77970	0.04460
F33	0.14151	0.74625	0.20684
F34	0.25808	0.69793	0.13518
F35	0.62638	0.05990	0.21642
F36	0.68300	0.03860	0.19037
F37	0.71832	0.26480	-0.03794
F38	0.61823	0.32203	-0.03030
F39	0.64070	0.06203	0.27936
F40	0.24805	0.20095	0.53107
F41	0.06213	0.01386	0.81778
F42	0.09133	0.52417	0.50386
F43	0.22628	0.41309	0.51327

Variance explained by each factor

FACTOR1	FACTOR2	FACTOR3
2.384497	2.320655	1.694648

Final Communality Estimates: Total = 6.399800

F32	F33	F34	F35	F36	F37
0.615321	0.619700	0.571980	0.442777	0.504224	0.587547

F38	F39	F40	F41	F42	F43
0.486828	0.492389	0.383947	0.672816	0.536975	0.485295

APPENDIX H

Computer Generated Discriminant Analysis/Analysis Sample

Discriminant Analysis

227 Observations	226 DF Total
6 Variables	225 DF Within Classes
2 Classes	1 DF Between Classes

Class Level Information

Q11	Output SAS Name	Frequency	Weight	Proportion	Prior Probability
1	_1	179	179.0000	0.788546	0.788546
2	_2	48	48.0000	0.211454	0.21145

Discriminant Analysis Within Covariance Matrix Information

Q11	Covariance Matrix Rank	Natural Log of the Determinant of the Covariance Matrix
1	6	2.43158
2	6	1.36599
Pooled	6	2.31468

Discriminant Analysis Test of Homogeneity of Within Covariance Matrices

Notation: K = Number of Groups

P = Number of Variables

N = Total Number of Observations - Number of Groups

N(i) = Number of Observations in the i'th Group - 1

$$V = \frac{\prod |\text{Within SS Matrix}(i)|^{N(i)/2}}{|\text{Pooled SS Matrix}|^{N/2}}$$

$$RHO = 1.0 - \left[\sum \frac{1}{N(i)} - \frac{1}{N} \right] \frac{2P^2 + 3P - 1}{6(P+1)(K-1)}$$

$$DF = .5(K-1)P(P+1)$$

Under null hypothesis: $-2\ RHO\ \ln \left[\frac{N^{PN/2}}{\prod N(i)^{PN(i)/2}} V \right]$

is distributed approximately as chi-square(DF)

Test Chi-Square Value = 22.649645
with 21 DF Prob > Chi-Sq = 0.3629

Since the chi-square value is not significant at the 0.1 level,
a pooled covariance matrix will be used in the discriminant function.

Reference: Morrison, D.F. (1976) Multivariate Statistical Methods p252.

Discriminant Analysis

Pairwise Generalized Squared Distances Between Groups

$$D^2(i|j) = (\bar{X}_i - \bar{X}_j)' \, COV^{-1} \, (\bar{X}_i - \bar{X}_j) - 2 \ln PRIOR_j$$

Generalized Squared Distance to Q11

From Q11	1	2
1	0.47513	3.86105
2	1.22868	3.10750

Discriminant Analysis

Multivariate Statistics and Exact F Statistics

S=1 M=2 N=109

Statistic	Value	F	Num DF	Den DF	Pr > F
Wilks' Lambda	0.88749650	4.6481	6	220	0.0002
Pillai's Trace	0.11250350	4.6481	6	220	0.0002
Hotelling-Lawley Trace	0.12676501	4.6481	6	220	0.0002
Roy's Greatest Root	0.12676501	4.6481	6	220	0.0002

Canonical Discriminant Analysis

	Canonical Correlation	Adjusted Canonical Correlation	Approx Standard Error	Squared Canonical Correlation
1	0.335415	0.306805	0.059035	0.112504

Eigenvalues of INV(E)*H
= CanRsq/(1-CanRsq)

	Eigenvalue	Difference	Proportion	Cumulative
1	0.1268	.	1.0000	1.0000

Test of H0: The canonical correlations in the current row and all that follow are zero

	Likelihood Ratio	Approx F	Num DF	Den DF	Pr > F
1	0.88749650	4.6481	6	220	0.0002

NOTE: The F statistic is exact.

Total Canonical Structure

	CAN1
F33	-0.598808
F37	0.077706
F40	0.018171
B21	-0.427246
B22	0.623058
B30	0.145382

Between Canonical Structure

	CAN1
F33	-1.000000
F37	1.000000
F40	1.000000

B21	-1.000000
B22	1.000000
B30	1.000000

Pooled Within Canonical Structure

	CAN1
F33	-0.575854
F37	0.073229
F40	0.017118
B21	-0.406693
B22	0.600218
B30	0.137123

Canonical Discriminant Analysis

Total-Sample Standardized Canonical Coefficients

	CAN1
F33	-.7237797332
F37	0.2042532792
F40	0.2065905687
B21	-.3958785032
B22	0.6780170580
B30	0.0999344714

Pooled Within-Class Standardized Canonical Coefficients

	CAN1
F33	-.7106044915
F37	0.2046371299
F40	0.2070453044
B21	-.3926621694
B22	0.6645177220
B30	0.1000371523

Raw Canonical Coefficients

	CAN1
F33	-.5461793457
F37	0.1563197605
F40	0.1631783338
B21	-.2824445976
B22	0.5962834696
B30	0.0884278152

Class Means on Canonical Variables

Q11	CAN1
1	-.1835574972
2	0.6845164999

Discriminant Analysis Linear Discriminant Function

$$\text{Constant} = -.5\ \bar{X}_j'\ \text{COV}^{-1}\ \bar{X}_j + \ln \text{PRIOR}_j \qquad \text{Coefficient Vector} = \text{COV}^{-1}\ \bar{X}_j$$

	Q11	
	1	2
CONSTANT	-8.84469	-10.19147
F33	0.83158	0.35746
F37	0.94393	1.07963
F40	1.47893	1.62059
B21	1.33351	1.08833
B22	1.11888	1.63650
B30	0.69088	0.76764

Discriminant Analysis

Classification Summary for Calibration Data: WORK.ANALYSIS

Resubstitution Summary using Linear Discriminant Function

Generalized Squared Distance Function:

$$D_j^2(X) = (X-\bar{X}_j)' \, COV_j^{-1} \, (X-\bar{X}_j) - 2 \ln PRIOR_j$$

Posterior Probability of Membership in each Q11:

$$Pr(j|X) = \exp(-.5\, D_j^2(X)) \,/\, SUM_k \exp(-.5\, D_k^2(X))$$

Number of Observations and Percent Classified into Q11:

From Q11	1	2	Total
.	5	0	5
	100.00	0.00	100.00
1	174	5	179
	97.21	2.79	100.00
2	44	4	48
	91.67	8.33	100.00
Total	223	9	232
Percent	96.12	3.88	100.00
Priors	0.7885	0.2115	

Error Count Estimates for Q11:

	1	2	Total
Rate	0.0279	0.9167	0.2159
Priors	0.7885	0.2115	

Discriminant Analysis

Classification Results for Calibration Data: WORK.ANALYSIS

Cross-validation Results using Linear Discriminant Function

Generalized Squared Distance Function:

$$D_j^2(X) = (X-\bar{X}_{(X)j})' \, COV_{(X)}^{-1} \, (X-\bar{X}_{(X)j}) - 2 \ln PRIOR_j$$

Posterior Probability of Membership in each Q11:

$$Pr(j|X) = \exp(-.5\, D_j^2(X)) \,/\, SUM_k \exp(-.5\, D_k^2(X))$$

Obs	From Q11	Classified into Q11	Posterior Probability of Membership in Q11: 1	2
1	1	1	0.9044	0.0956
2	1	1	0.7045	0.2955
3	1	1	0.8112	0.1888
4	1	1	0.8697	0.1303
5	1	1	0.7891	0.2109
6	1	1	0.7456	0.2544
7	1	1	0.8500	0.1500
8	1	1	0.8439	0.1561
9	1	1	0.7575	0.2425
10	1	1	0.7477	0.2523
11	2	1 *	0.7132	0.2868
12	1	1	0.8793	0.1207
13	1	1	0.8732	0.1268
14	1	1	0.9816	0.0184
15	2	1 *	0.9201	0.0799
16	1	1	0.8916	0.1084
17	1	1	0.8728	0.1272
18	2	2	0.4205	0.5795
19	1	1	0.9128	0.0872
20	1	1	0.7531	0.2469
21	.	1 *	0.8414	0.1586
22	1	1	0.7914	0.2086
23	1	1	0.5668	0.4332

24	1	1	0.8248	0.1752
25	1	1	0.9740	0.0260
26	1	1	0.9209	0.0791
27	1	2 *	0.4464	0.5536
28	1	1	0.8320	0.1680
29	1	1	0.5396	0.4604
30	1	1	0.9153	0.0847
31	1	1	0.7061	0.2939
32	1	1	0.9158	0.0842
33	1	1	0.8569	0.1431
34	.	1 *	0.6269	0.3731
35	2	1 *	0.8094	0.1906
36	2	1 *	0.7576	0.2424
37	1	1	0.6327	0.3673
38	1	1	0.8385	0.1615
39	1	1	0.7063	0.2937
40	1	1	0.8014	0.1986
41	1	1	0.8231	0.1769
42	1	1	0.8760	0.1240
44	1	1	0.8744	0.1256
45	2	1 *	0.6044	0.3956
46	2	2	0.4592	0.5408
47	1	1	0.9425	0.0575
48	1	1	0.9376	0.0624
49	1	1	0.8231	0.1769
50	1	1	0.8767	0.1233
51	1	1	0.9618	0.0382
52	1	1	0.6862	0.3138
53	2	1 *	0.5953	0.4047
54	2	1 *	0.7853	0.2147
55	1	1	0.9454	0.0546
56	2	1 *	0.7132	0.2868
57	1	1	0.9143	0.0857
58	1	1	0.8330	0.1670
59	1	1	0.9327	0.0673
60	2	1 *	0.6436	0.3564
61	1	1	0.8155	0.1845
62	1	1	0.6102	0.3898
63	1	1	0.7875	0.2125
64	1	1	0.7875	0.2125
65	2	1 *	0.6463	0.3537
67	1	1	0.8744	0.1256
68	1	1	0.5651	0.4349
69	2	1 *	0.7215	0.2785
70	1	1	0.8875	0.1125
71	2	1 *	0.8610	0.1390

72	1	1	0.6198	0.3802
74	1	1	0.6972	0.3028
75	2	1 *	0.8151	0.1849
76	1	1	0.7622	0.2378
77	1	1	0.8744	0.1256
78	1	1	0.9184	0.0816
79	1	1	0.9062	0.0938
80	1	1	0.8067	0.1933
81	1	1	0.9511	0.0489
82	2	1 *	0.8238	0.1762
83	2	2	0.3921	0.6079
84	1	1	0.8852	0.1148
85	2	1 *	0.6160	0.3840
86	1	1	0.8530	0.1470
87	2	1 *	0.7401	0.2599
88	1	1	0.6683	0.3317
89	1	1	0.5276	0.4724
90	1	1	0.7575	0.2425
91	1	1	0.9490	0.0510
92	1	1	0.9359	0.0641
93	1	1	0.8225	0.1775
94	1	1	0.9063	0.0937
95	1	1	0.9634	0.0366
96	1	1	0.9419	0.0581
97	2	1 *	0.5953	0.4047
98	1	2 *	0.2882	0.7118
99	1	1	0.9221	0.0779
100	1	1	0.7160	0.2840
101	1	1	0.9522	0.0478
102	1	1	0.7595	0.2405
103	1	1	0.9198	0.0802
104	1	2 *	0.4774	0.5226
105	1	1	0.9719	0.0281
106	2	1 *	0.7060	0.2940
107	1	1	0.8264	0.1736
108	2	1 *	0.8648	0.1352
109	1	1	0.9250	0.0750
110	1	1	0.6764	0.3236
111	1	1	0.9496	0.0504
112	1	1	0.8231	0.1769
113	1	1	0.7682	0.2318
114	1	1	0.8760	0.1240
115	1	1	0.7027	0.2973
116	1	1	0.6707	0.3293
118	1	1	0.6327	0.3673
119	1	1	0.9645	0.0355

120	1	1	0.9374	0.0626
121	1	1	0.7798	0.2202
122	2	1 *	0.7132	0.2868
123	1	1	0.7265	0.2735
124	1	1	0.7756	0.2244
125	1	1	0.8993	0.1007
126	2	1 *	0.5961	0.4039
127	1	1	0.7859	0.2141
128	1	1	0.7057	0.2943
129	1	1	0.8522	0.1478
130	2	1 *	0.8046	0.1954
131	1	1	0.7463	0.2537
132	2	1 *	0.7969	0.2031
133	1	1	0.6987	0.3013
134	2	1 *	0.6422	0.3578
135	1	1	0.8823	0.1177
136	1	1	0.8418	0.1582
137	1	1	0.7833	0.2167
138	2	1 *	0.7153	0.2847
139	1	1	0.8656	0.1344
140	1	2 *	0.2470	0.7530
141	2	1 *	0.7943	0.2057
142	2	1 *	0.5800	0.4200
143	1	1	0.7700	0.2300
144	1	1	0.6049	0.3951
145	1	1	0.8058	0.1942
146	1	1	0.8519	0.1481
147	1	1	0.6922	0.3078
148	1	1	0.5483	0.4517
149	2	1 *	0.5671	0.4329
150	1	1	0.5987	0.4013
151	1	1	0.8715	0.1285
152	2	1 *	0.7229	0.2771
153	1	1	0.8677	0.1323
154	1	1	0.9608	0.0392
155	1	1	0.9089	0.0911
156	1	1	0.7452	0.2548
157	1	1	0.8834	0.1166
158	1	1	0.8276	0.1724
159	1	1	0.9558	0.0442
160	1	1	0.7457	0.2543
161	1	1	0.9339	0.0661
162	1	1	0.9478	0.0522
163	1	1	0.6479	0.3521
164	1	1	0.9490	0.0510
165	1	1	0.6194	0.3806

166	2	1 *	0.6422	0.3578
167	1	1	0.8023	0.1977
168	1	1	0.8611	0.1389
169	1	1	0.8619	0.1381
170	2	1 *	0.8729	0.1271
171	1	1	0.8203	0.1797
172	2	1 *	0.8116	0.1884
173	1	1	0.8117	0.1883
174	1	1	0.6620	0.3380
175	2	1 *	0.8467	0.1533
176	1	1	0.5282	0.4718
177	1	1	0.9614	0.0386
178	1	1	0.9250	0.0750
179	1	1	0.6663	0.3337
180	1	1	0.8702	0.1298
181	1	1	0.8118	0.1882
182	1	1	0.9085	0.0915
183	1	2 *	0.2523	0.7477
184	1	1	0.8287	0.1713
185	1	1	0.8304	0.1696
186	1	1	0.8936	0.1064
187	2	1 *	0.9283	0.0717
188	1	1	0.9490	0.0510
189	1	1	0.6392	0.3608
190	1	1	0.9418	0.0582
191	1	1	0.8081	0.1919
192	2	1 *	0.7943	0.2057
193	1	1	0.9419	0.0581
194	1	1	0.9473	0.0527
195	2	1 *	0.7132	0.2868
196	1	1	0.8408	0.1592
197	2	1 *	0.7943	0.2057
198	2	1 *	0.8017	0.1983
200	1	1	0.9134	0.0866
201	1	1	0.8697	0.1303
202	1	1	0.8611	0.1389
203	1	1	0.9541	0.0459
204	.	1 *	0.8945	0.1055
205	1	1	0.8917	0.1083
206	1	1	0.8418	0.1582
207	1	1	0.6753	0.3247
208	1	1	0.8743	0.1257
209	2	1 *	0.6728	0.3272
210	1	1	0.9441	0.0559
211	1	1	0.9692	0.0308
212	1	1	0.6952	0.3048

213	1	1		0.6507	0.3493
214	2	2		0.3645	0.6355
215	2	1	*	0.9509	0.0491
216	2	1	*	0.8196	0.1804
217	1	1		0.6211	0.3789
218	1	1		0.7061	0.2939
219	1	1		0.8969	0.1031
220	1	1		0.8530	0.1470
221	1	1		0.9266	0.0734
222	1	1		0.9194	0.0806
223	2	1	*	0.9379	0.0621
224	1	1		0.6147	0.3853
225	.	1	*	0.9262	0.0738
226	1	1		0.8167	0.1833
227	2	1	*	0.7537	0.2463
228	2	1	*	0.7132	0.2868
229	.	1	*	0.7782	0.2218
230	1	1		0.9381	0.0619
231	1	1		0.7575	0.2425
232	1	1		0.9454	0.0546
233	1	1		0.7504	0.2496
234	1	1		0.7965	0.2035
235	1	1		0.6262	0.3738
236	1	2	*	0.4927	0.5073
237	1	1		0.9304	0.0696

* Misclassified observation

Discriminant Analysis

Classification Summary for Calibration Data: WORK.ANALYSIS

Cross-validation Summary using Linear Discriminant Function

Generalized Squared Distance Function:

$$D^2_j(X) = (X-\bar{X}_{(X)j})' \, COV^{-1}_{(X)} \, (X-\bar{X}_{(X)j}) - 2 \ln PRIOR_j$$

Posterior Probability of Membership in each Q11:

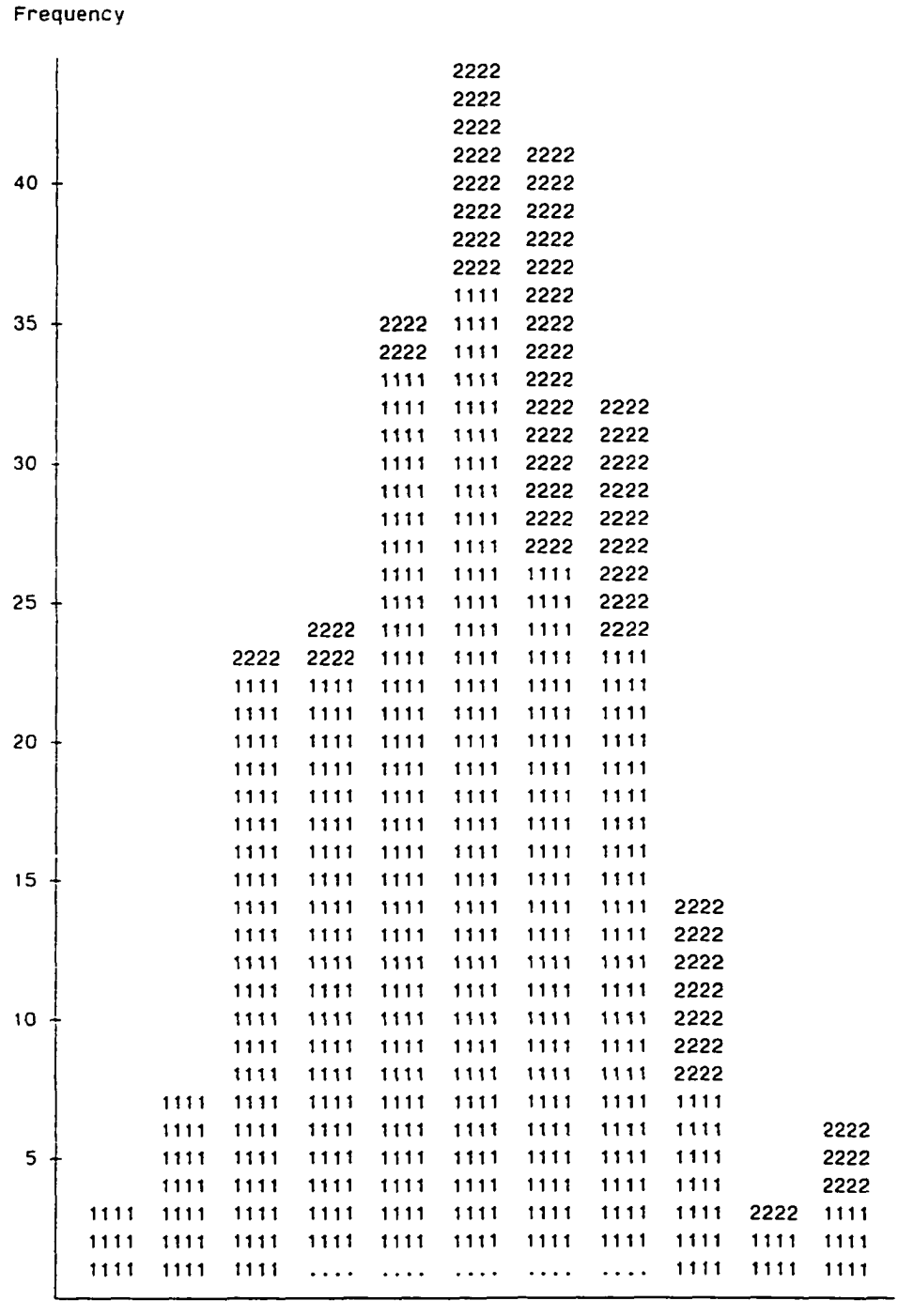
$$Pr(j|X) = \exp(-.5\, D^2_j(X)) \,/\, SUM_k \exp(-.5\, D^2_k(X))$$

Number of Observations and Percent Classified into Q11:

From Q11	1	2	Total
.	5	0	5
	100.00	0.00	100.00
1	173	6	179
	96.65	3.35	100.00
2	44	4	48
	91.67	8.33	100.00
Total	222	10	232
Percent	95.69	4.31	100.00
Priors	0.7885	0.2115	

Error Count Estimates for Q11:

	1	2	Total
Rate	0.0335	0.9167	0.2203
Priors	0.7885	0.2115	


Frequency
40
35
30
25
20
15
10
5
-2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5
CAN1 Midpoint
Symbol Q11
Symbol Q11
Symbol Q11
. .
1 1
2 2

APPENDIX I

Computer Generated Discriminant Analysis/Validation Sample

Discriminant Analysis

73 Observations	72 DF Total
6 Variables	71 DF Within Classes
2 Classes	1 DF Between Classes

Class Level Information

Q11	Output SAS Name	Frequency	Weight	Proportion	Prior Probability
1	_1	60	60.0000	0.821918	0.821918
2	_2	13	13.0000	0.178082	0.178082

Discriminant Analysis Within Covariance Matrix Information

Q11	Covariance Matrix Rank	Natural Log of the Determinant of the Covariance Matrix
1	6	2.56377
2	6	1.95966
Pooled	6	2.66805

Discriminant Analysis Test of Homogeneity of Within Covariance Matrices

Notation: K = Number of Groups

P = Number of Variables

N = Total Number of Observations - Number of Groups

N(i) = Number of Observations in the i'th Group - 1

$$V = \frac{\prod |\text{Within SS Matrix}(i)|^{N(i)/2}}{|\text{Pooled SS Matrix}|^{N/2}}$$

$$RHO = 1.0 - \left[\sum \frac{1}{N(i)} - \frac{1}{N} \right] \frac{2P^2 + 3P - 1}{6(P+1)(K-1)}$$

$$DF = .5(K-1)P(P+1)$$

Under null hypothesis: $-2\ RHO\ \ln \left[\frac{N^{PN/2}\ V}{\prod N(i)^{PN(i)/2}} \right]$

is distributed approximately as chi-square(DF)

Test Chi-Square Value = 11.976845
with 21 DF Prob > Chi-Sq = 0.9402

Since the chi-square value is not significant at the 0.1 level,
a pooled covariance matrix will be used in the discriminant function.

Reference: Morrison, D.F. (1976) Multivariate Statistical Methods p252.

Discriminant Analysis

Pairwise Generalized Squared Distances Between Groups

$$D^2(i|j) = (\bar{X}_i - \bar{X}_j)' \, COV^{-1} \, (\bar{X}_i - \bar{X}_j) - 2 \ln PRIOR_j$$

Generalized Squared Distance to Q11

From Q11	1	2
1	0.39223	3.94232
2	0.88353	3.45102

Discriminant Analysis

Multivariate Statistics and Exact F Statistics

S=1 M=2 N=32

Statistic	Value	F	Num DF	Den DF	Pr > F
Wilks' Lambda	0.93115302	0.8133	6	66	0.5634
Pillai's Trace	0.06884698	0.8133	6	66	0.5634
Hotelling-Lawley Trace	0.07393735	0.8133	6	66	0.5634
Roy's Greatest Root	0.07393735	0.8133	6	66	0.5634

Canonical Discriminant Analysis

	Canonical Correlation	Adjusted Canonical Correlation	Approx Standard Error	Squared Canonical Correlation
1	0.262387	0.140862	0.109737	0.068847

Eigenvalues of INV(E)*H
= CanRsq/(1-CanRsq)

	Eigenvalue	Difference	Proportion	Cumulative
1	0.0739	.	1.0000	1.0000

Test of HO: The canonical correlations in the current row and all that follow are zero

	Likelihood Ratio	Approx F	Num DF	Den DF	Pr > F
1	0.93115302	0.8133	6	66	0.5634

NOTE: The F statistic is exact.

Total Canonical Structure

	CAN1
F33	-0.733686
F37	0.352212
F40	0.083843
B21	0.356048
B22	-0.473691
B30	0.276898

Between Canonical Structure

	CAN1
F33	-1.000000
F37	1.000000
F40	1.000000
B21	1.000000

B22	-1.000000
B30	1.000000

Pooled Within Canonical Structure

	CAN1
F33	-0.721475
F37	0.341332
F40	0.080925
B21	0.345083
B22	-0.460666
B30	0.267905

Canonical Discriminant Analysis

Total-Sample Standardized Canonical Coefficients

	CAN1
F33	-.8153130608
F37	0.1595394246
F40	0.2830246418
B21	0.1497249500
B22	-.4406557416
B30	0.3211959199

Pooled Within-Class Standardized Canonical Coefficients

	CAN1
F33	-.8056772172
F37	0.1599714736
F40	0.2849418273
B21	0.1501162551
B22	-.4403072294
B30	0.3225951301

Raw Canonical Coefficients

	CAN1
F33	-.6485688921
F37	0.1157096252
F40	0.2001096081
B21	0.1045084451
B22	-.4077020788
B30	0.2700036351

Class Means on Canonical Variables

Q11	CAN1
1	-.1248233187
2	0.5761076248

Discriminant Analysis Linear Discriminant Function

$$\text{Constant} = -.5\ \bar{X}_j'\ \text{COV}^{-1}\ \bar{X}_j + \ln \text{PRIOR}_j \qquad \text{Coefficient Vector} = \text{COV}^{-1}\ \bar{X}_j$$

Q11

	1	2
CONSTANT	-10.48620	-11.60886
F33	1.86295	1.40835
F37	1.40938	1.49048
F40	0.75358	0.89384
B21	1.17632	1.24957
B22	1.75158	1.46581
B30	0.86021	1.04946

Discriminant Analysis

Classification Summary for Calibration Data: WORK.VALID

Resubstitution Summary using Linear Discriminant Function

Generalized Squared Distance Function:

$$D^2_j(X) = (X-\bar{X}_j)' \, COV^{-1} \, (X-\bar{X}_j) - 2 \ln PRIOR_j$$

Posterior Probability of Membership in each Q11:

$$Pr(j|X) = \exp(-.5\, D^2_j(X)) \,/\, SUM_k \exp(-.5\, D^2_k(X))$$

Number of Observations and Percent Classified into Q11:

From Q11	1	2	Total
.	1	0	1
	100.00	0.00	100.00
1	59	1	60
	98.33	1.67	100.00
2	13	0	13
	100.00	0.00	100.00
Total	73	1	74
Percent	98.65	1.35	100.00
Priors	0.8219	0.1781	

Error Count Estimates for Q11:

	1	2	Total
Rate	0.0167	1.0000	0.1918
Priors	0.8219	0.1781	

Discriminant Analysis

Classification Results for Calibration Data: WORK.VALID

Cross-validation Results using Linear Discriminant Function

Generalized Squared Distance Function:

$$D_j^2(X) = (X-\bar{X}_{(X)j})' \, COV_{(X)}^{-1} \, (X-\bar{X}_{(X)j}) - 2 \ln PRIOR_j$$

Posterior Probability of Membership in each Q11:

$$Pr(j|X) = \exp(-.5\, D_j^2(X)) \,/\, SUM_k \exp(-.5\, D_k^2(X))$$

Obs	From Q11	Classified into Q11	Posterior Probability of Membership in Q11: 1	2
1	1	1	0.8036	0.1964
2	1	1	0.7645	0.2355
3	1	1	0.7337	0.2663
4	1	1	0.7921	0.2079
5	1	1	0.7536	0.2464
6	1	1	0.7797	0.2203
7	1	1	0.6585	0.3415
8	.	1 *	0.8690	0.1310
9	1	1	0.7248	0.2752
10	1	1	0.8047	0.1953
11	1	1	0.8772	0.1228
12	1	1	0.6106	0.3894
13	1	1	0.7855	0.2145
14	1	2 *	0.4293	0.5707
15	1	1	0.9585	0.0415
16	1	1	0.8665	0.1335
17	1	1	0.9026	0.0974
18	1	1	0.9825	0.0175
19	1	1	0.9135	0.0865
20	1	1	0.8202	0.1798
21	1	1	0.8068	0.1932
23	1	1	0.8327	0.1673
24	2	1 *	0.9791	0.0209

25	1	1	0.7835	0.2165
26	1	1	0.8371	0.1629
27	1	1	0.8911	0.1089
28	1	1	0.8226	0.1774
29	1	1	0.8440	0.1560
30	2	1 *	0.8956	0.1044
31	1	1	0.8993	0.1007
32	2	1 *	0.6931	0.3069
33	2	1 *	0.9605	0.0395
34	2	1 *	0.7416	0.2584
35	1	1	0.8293	0.1707
36	1	1	0.8594	0.1406
38	2	1 *	0.7549	0.2451
39	1	1	0.9362	0.0638
40	2	1 *	0.8668	0.1332
41	1	1	0.7195	0.2805
42	1	1	0.9444	0.0556
43	1	1	0.8556	0.1444
44	1	1	0.7612	0.2388
45	1	1	0.8771	0.1229
46	2	1 *	0.9308	0.0692
47	1	1	0.8936	0.1064
48	1	1	0.9540	0.0460
49	1	1	0.7651	0.2349
50	2	1 *	0.9269	0.0731
51	1	1	0.8770	0.1230
52	1	1	0.8865	0.1135
53	1	1	0.7340	0.2660
54	1	1	0.6171	0.3829
55	1	1	0.8884	0.1116
56	1	2 *	0.3479	0.6521
57	2	1 *	0.8963	0.1037
58	1	1	0.7727	0.2273
59	1	1	0.8117	0.1883
60	2	1 *	0.6787	0.3213
61	2	1 *	0.8483	0.1517
62	1	1	0.9163	0.0837
63	1	1	0.8616	0.1384
64	1	1	0.8772	0.1228
65	1	1	0.8970	0.1030
66	1	1	0.8997	0.1003
67	2	1 *	0.6281	0.3719
68	1	1	0.9329	0.0671
69	1	1	0.9112	0.0888
70	1	1	0.8883	0.1117
71	1	1	0.8997	0.1003

72	1	1	0.7553	0.2447
73	1	1	0.9223	0.0777
74	1	1	0.7438	0.2562
75	1	1	0.8886	0.1114
76	1	1	0.6688	0.3312

* Misclassified observation

Discriminant Analysis

Classification Summary for Calibration Data: WORK.VALID

Cross-validation Summary using Linear Discriminant Function

Generalized Squared Distance Function:

$$D^2_j(X) = (X-\bar{X}_{(X)j})' \, COV^{-1}_{(X)} \, (X-\bar{X}_{(X)j}) - 2 \ln PRIOR_j$$

Posterior Probability of Membership in each Q11:

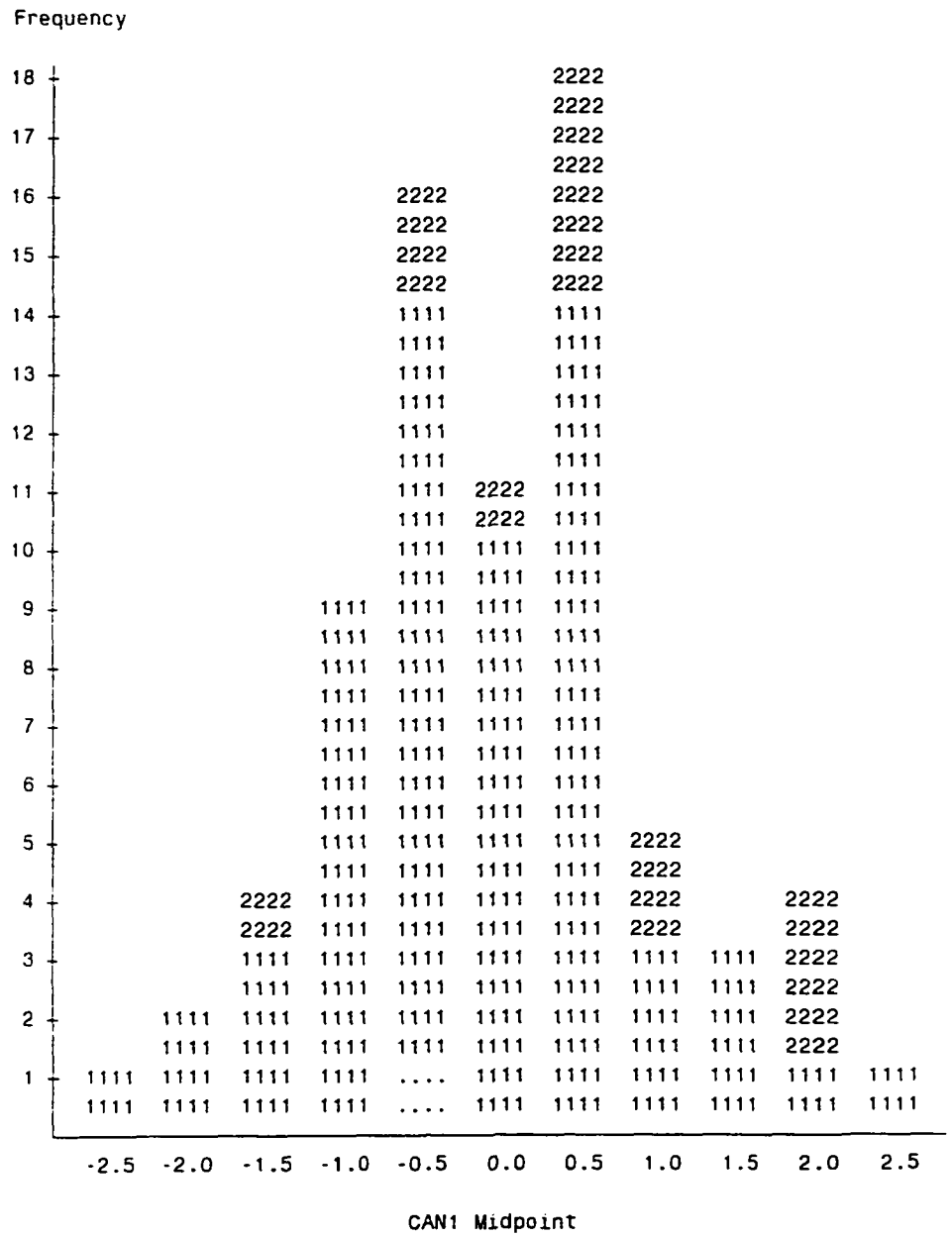
$$Pr(j|X) = \exp(-.5\, D^2_j(X)) \,/\, SUM_k \exp(-.5\, D^2_k(X))$$

Number of Observations and Percent Classified into Q11:

From Q11	1	2	Total
.	1	0	1
	100.00	0.00	100.00
1	58	2	60
	96.67	3.33	100.00
2	13	0	13
	100.00	0.00	100.00
Total	72	2	74
Percent	97.30	2.70	100.00
Priors	0.8219	0.1781	

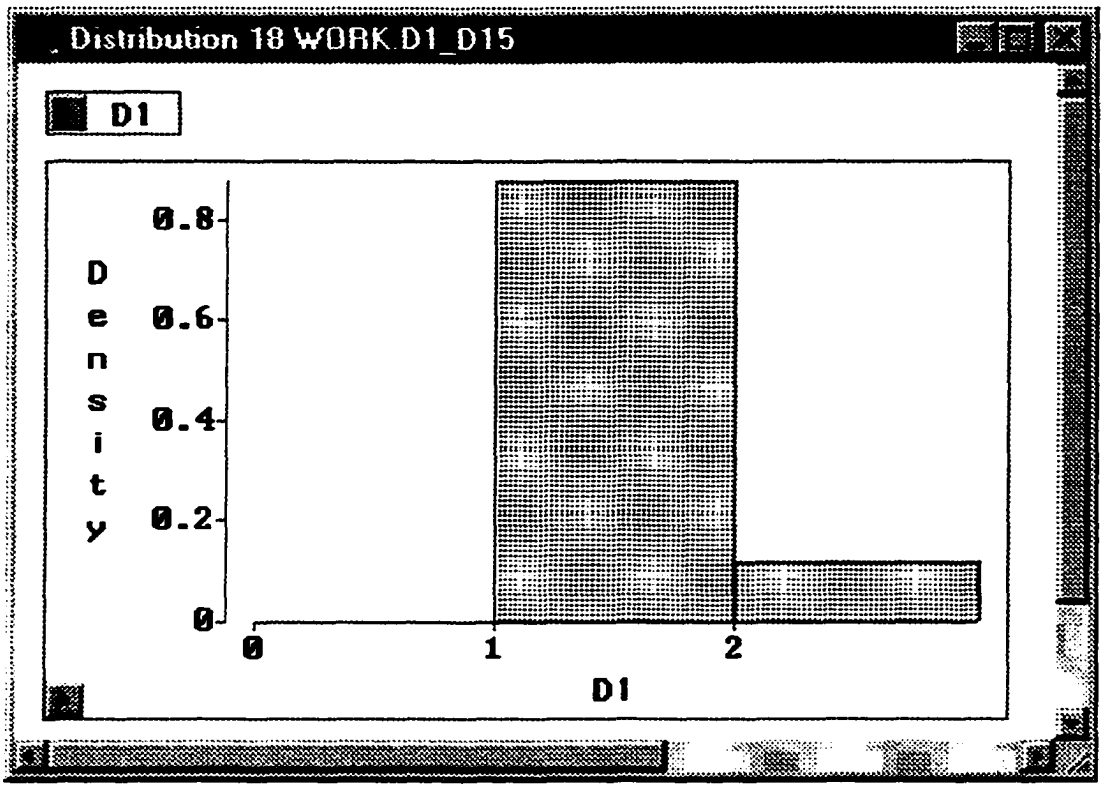
Error Count Estimates for Q11:

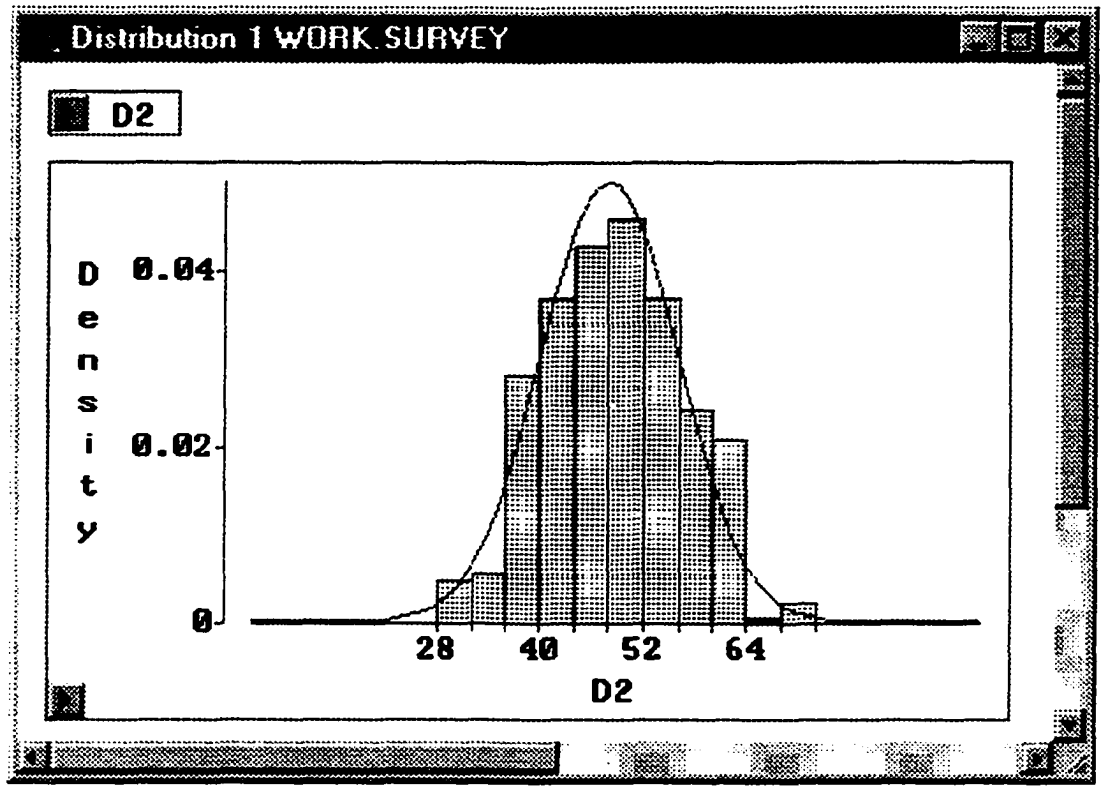
	1	2	Total
Rate	0.0333	1.0000	0.2055
Priors	0.8219	0.1781	

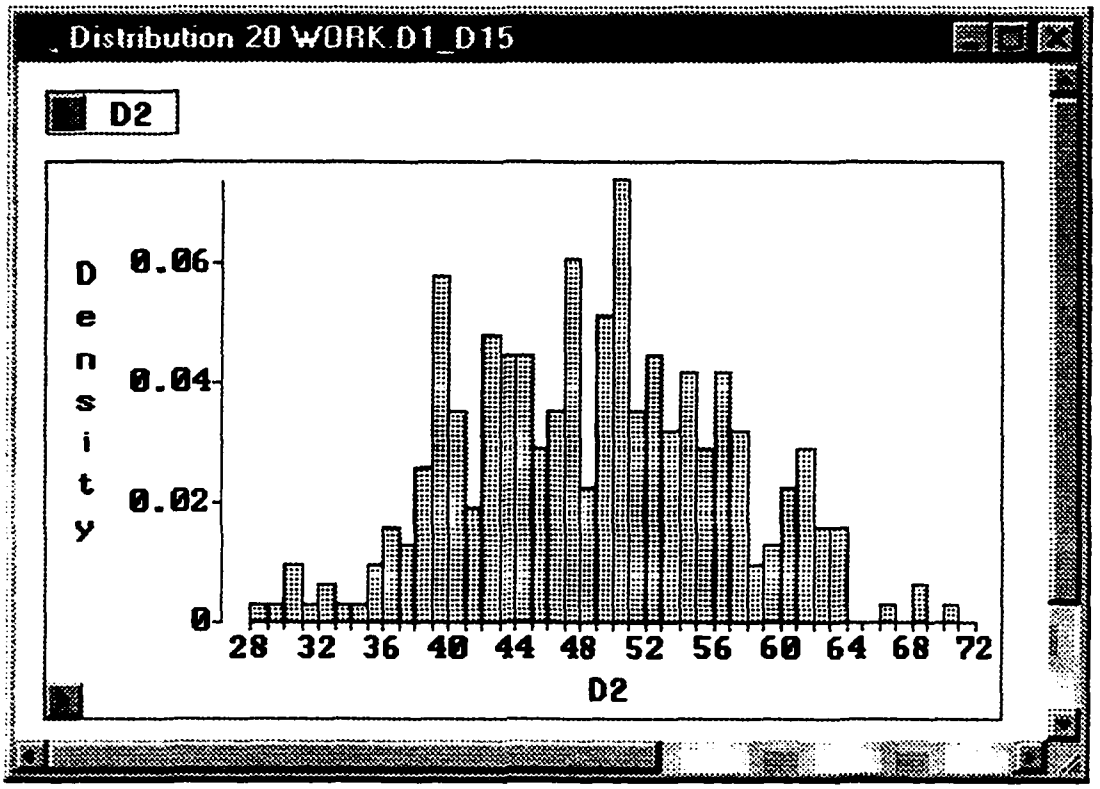

Frequency
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
-2.5 -2.0 -1.5 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5
CAN1 Midpoint
Symbol Q11 Symbol Q11 Symbol Q11
. . 1 1 2 2

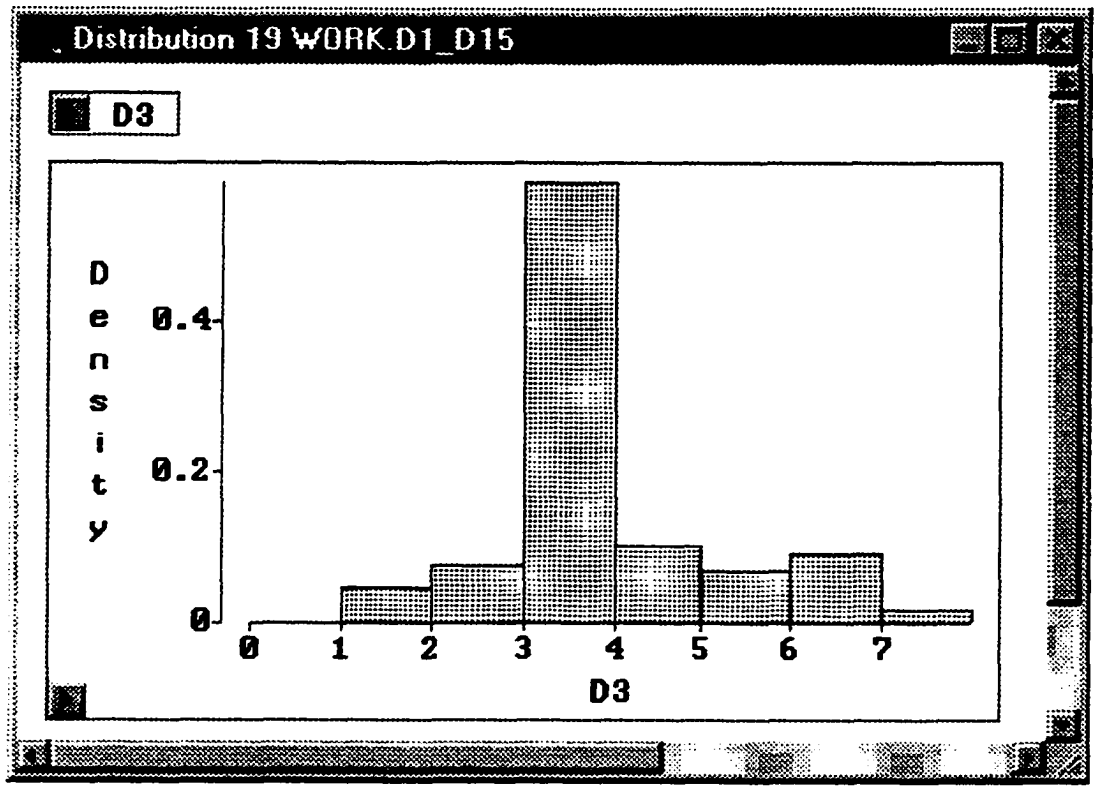
APPENDIX J

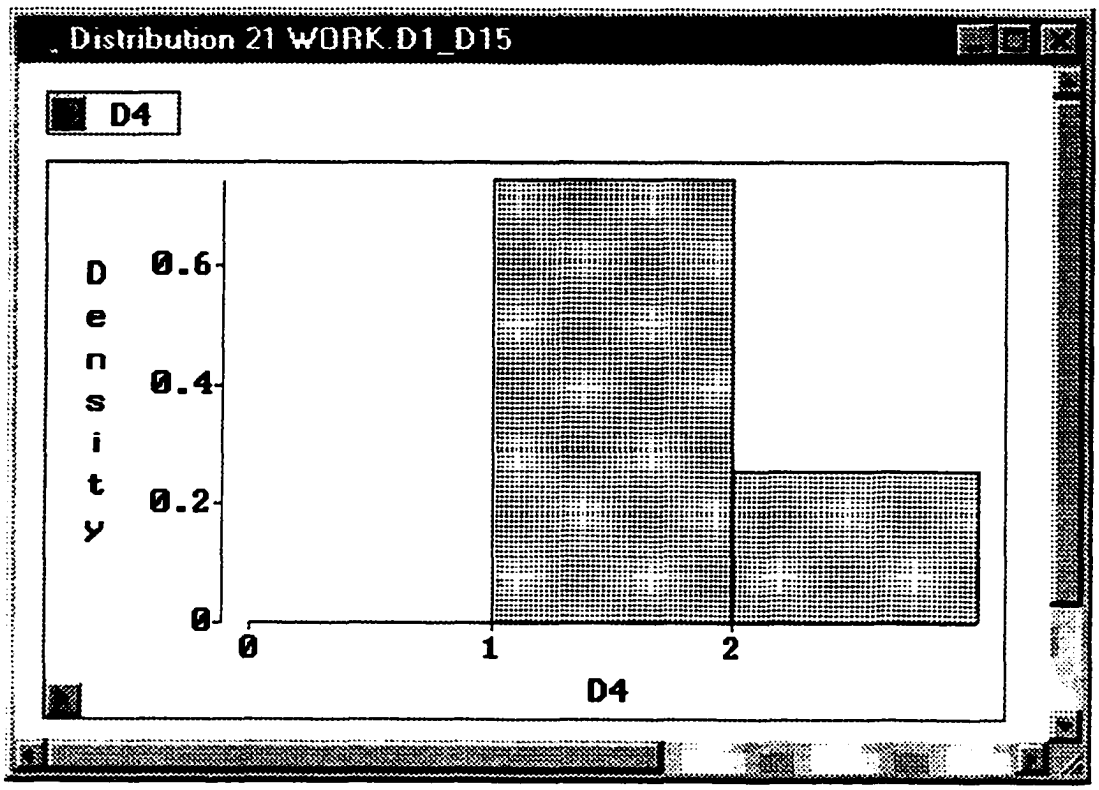
Computer Generated Demographic Density Charts

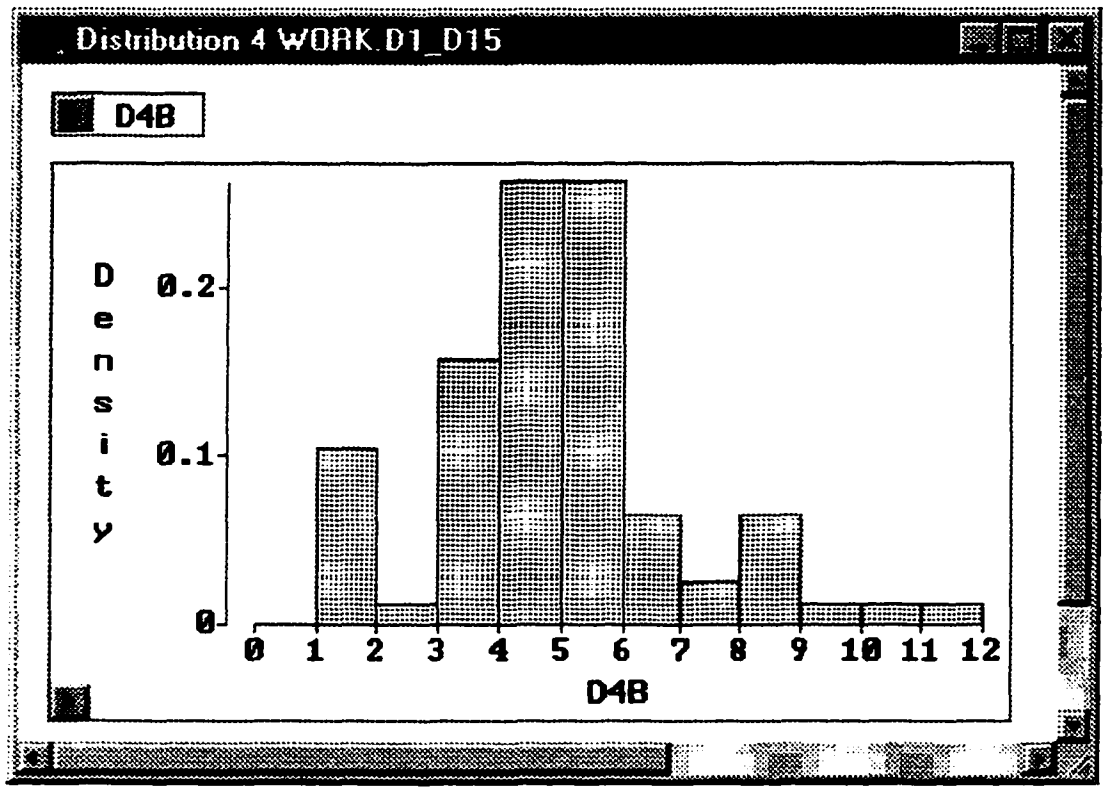

Distribution 18 WORK.D1_D15
D1
Density
0.8
0.6
0.4
0.2
0
0
1
2
D1

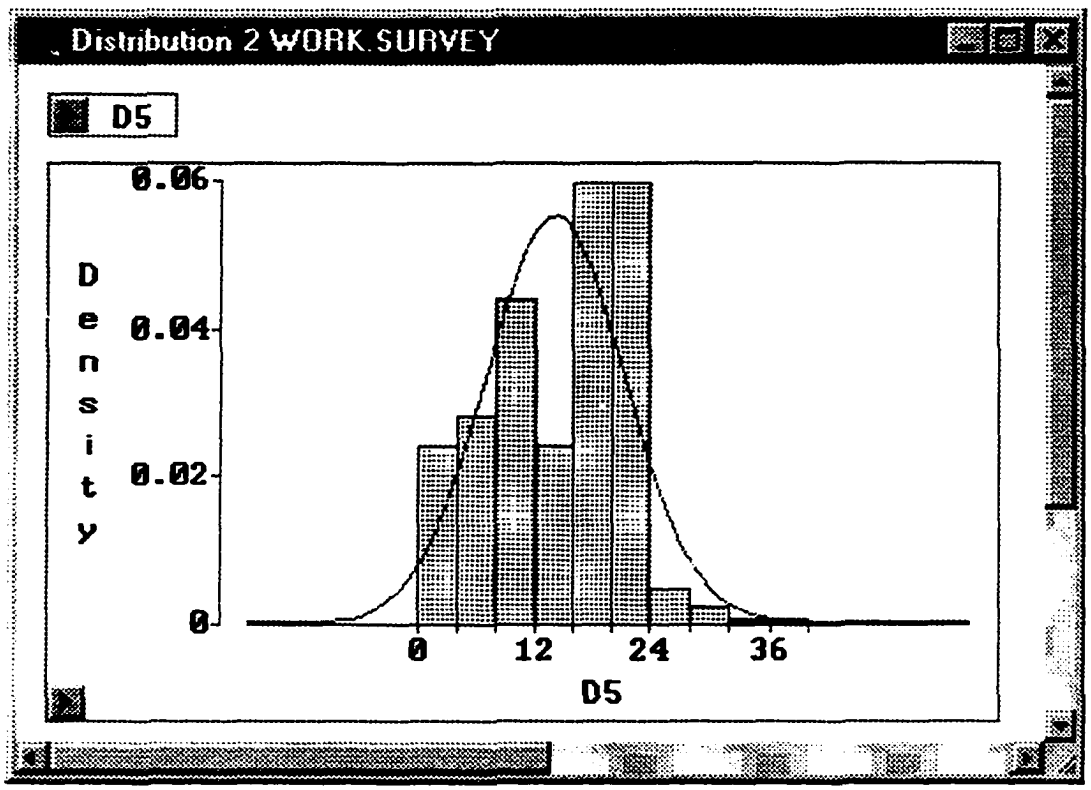

Distribution 1 WORK.SURVEY
D2
Density
0.04
0.02
0
28
40
52
64
D2

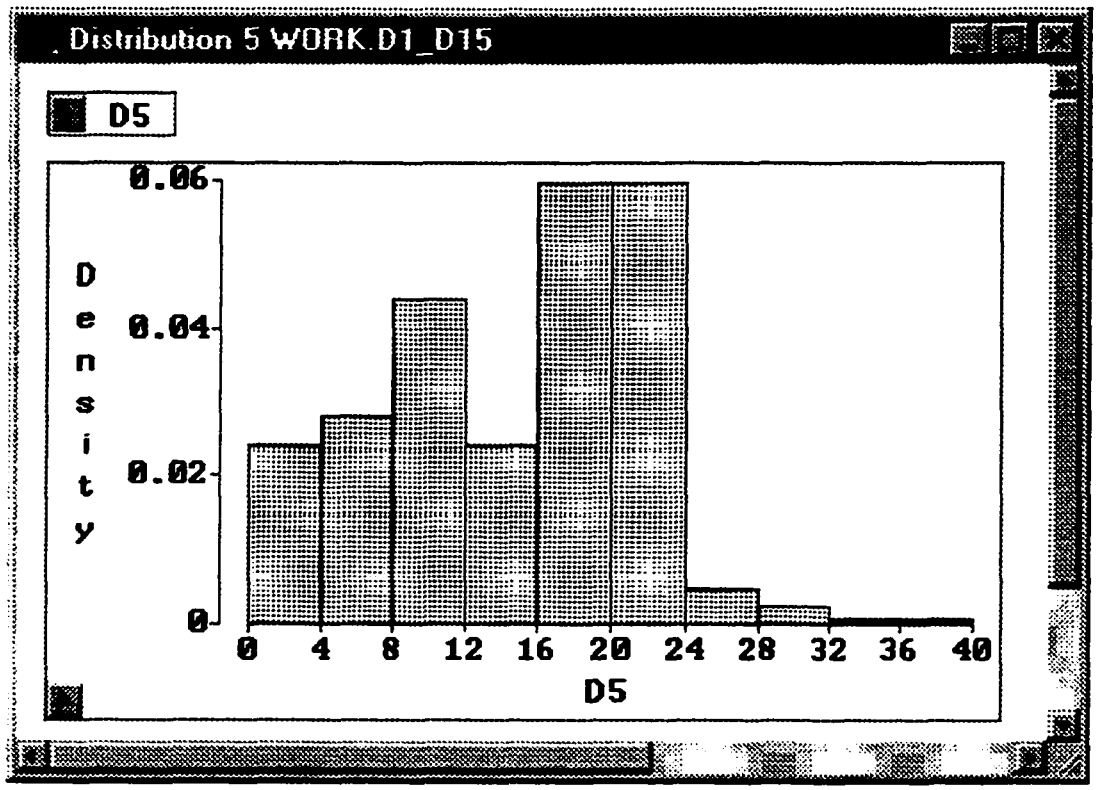

Distribution 20 WORK.D1_D15
D2
Density
0.06
0.04
0.02
0
28 32 36 40 44 48 52 56 60 64 68 72
D2

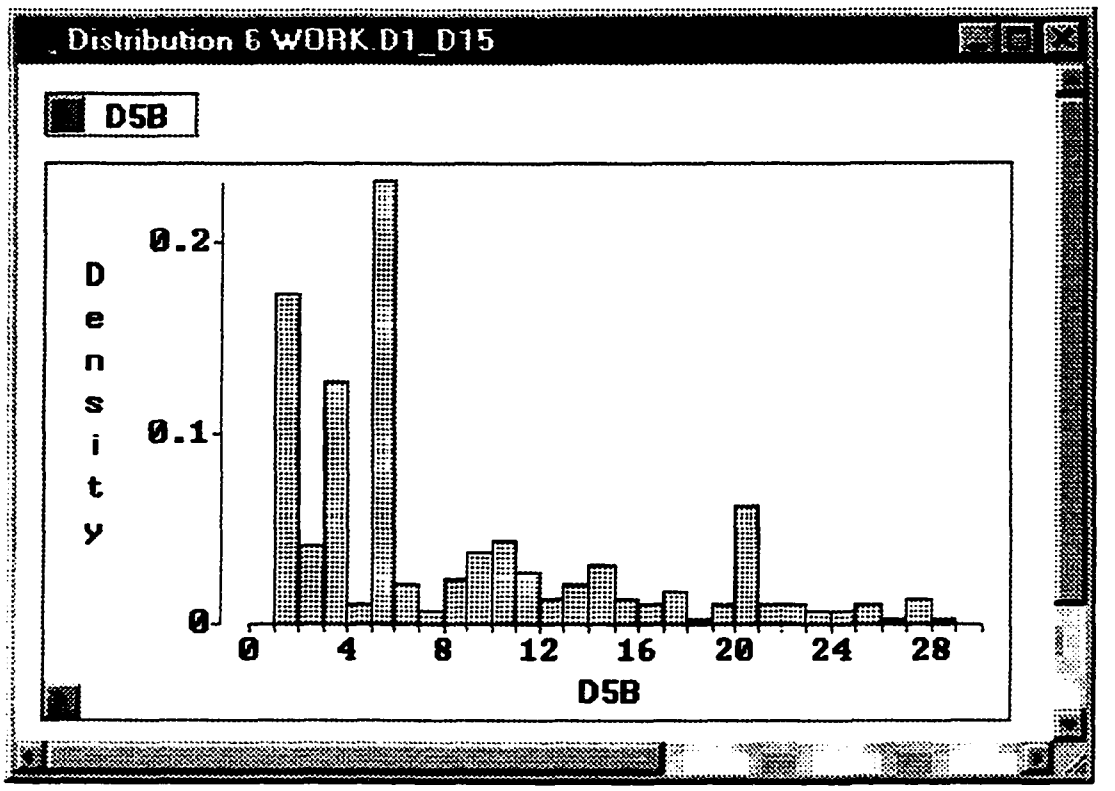

Distribution 19 WORK.D1_D15
D3
Density
0.4
0.2
0
0
1
2
3
4
5
6
7
D3

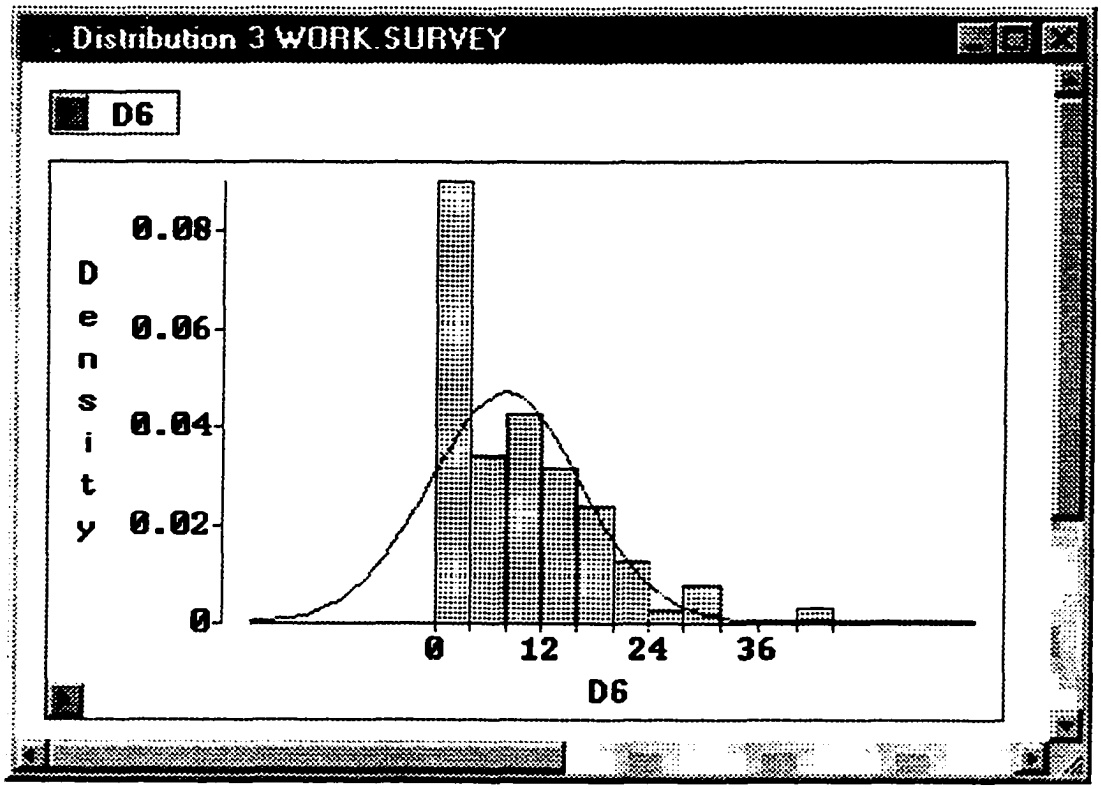

Distribution 21 WORK.D1_D15
D4
Density
0.6
0.4
0.2
0
0
1
2
D4

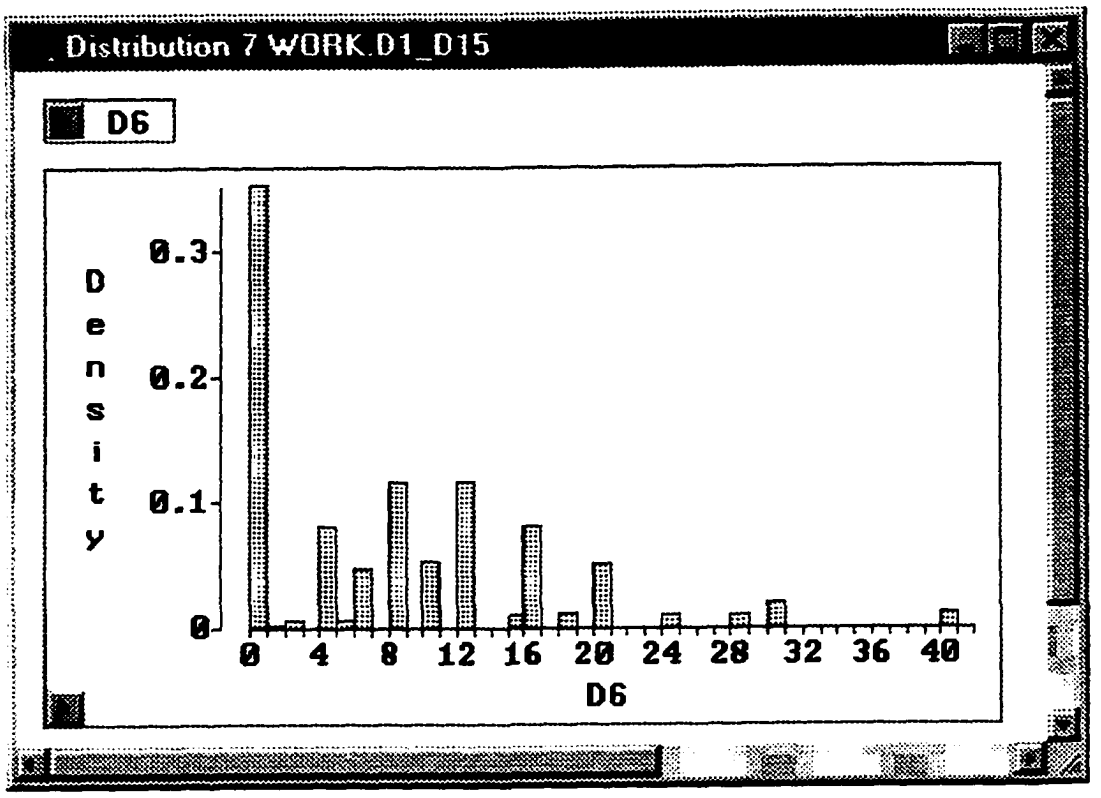

Distribution 4 WORK.D1_D15
D4B
Density
0.2
0.1
0
0 1 2 3 4 5 6 7 8 9 10 11 12
D4B

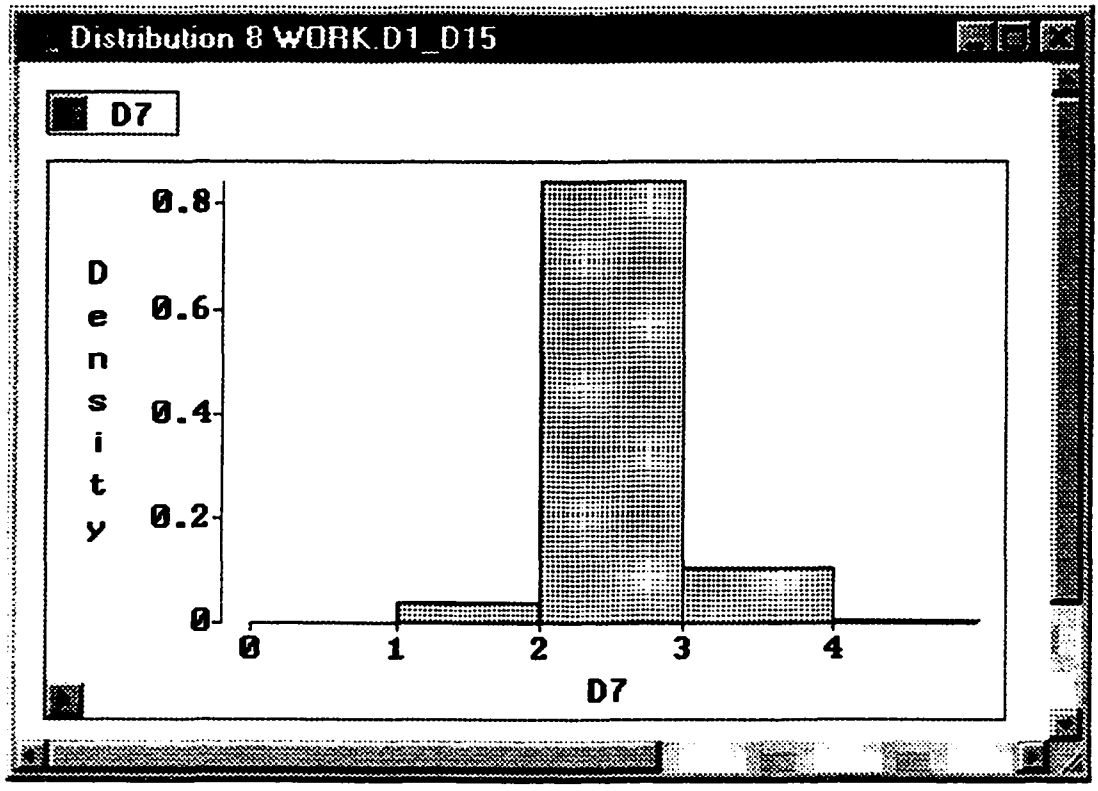

Distribution 2 WORK.SURVEY
D5
0.06
0.04
0.02
0
Density
0
12
24
36
D5

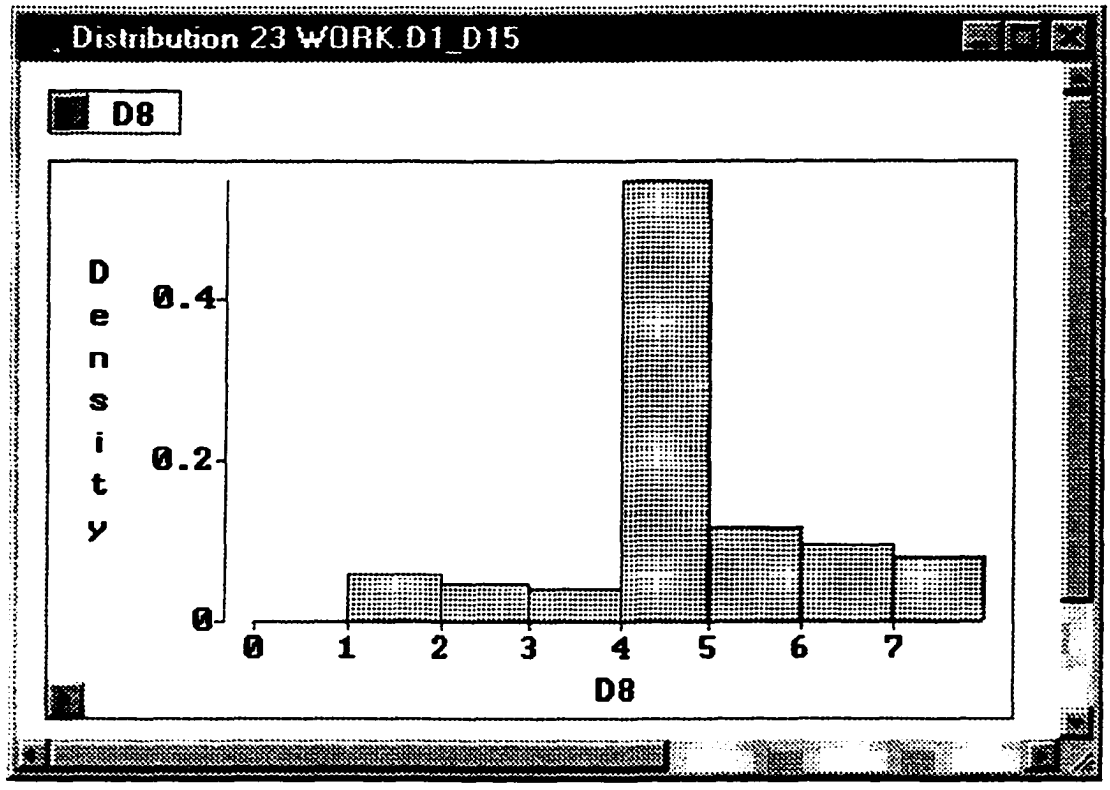

Distribution 5 WORK.D1_D15
D5
Density
0.06
0.04
0.02
0
0 4 8 12 16 20 24 28 32 36 40
D5

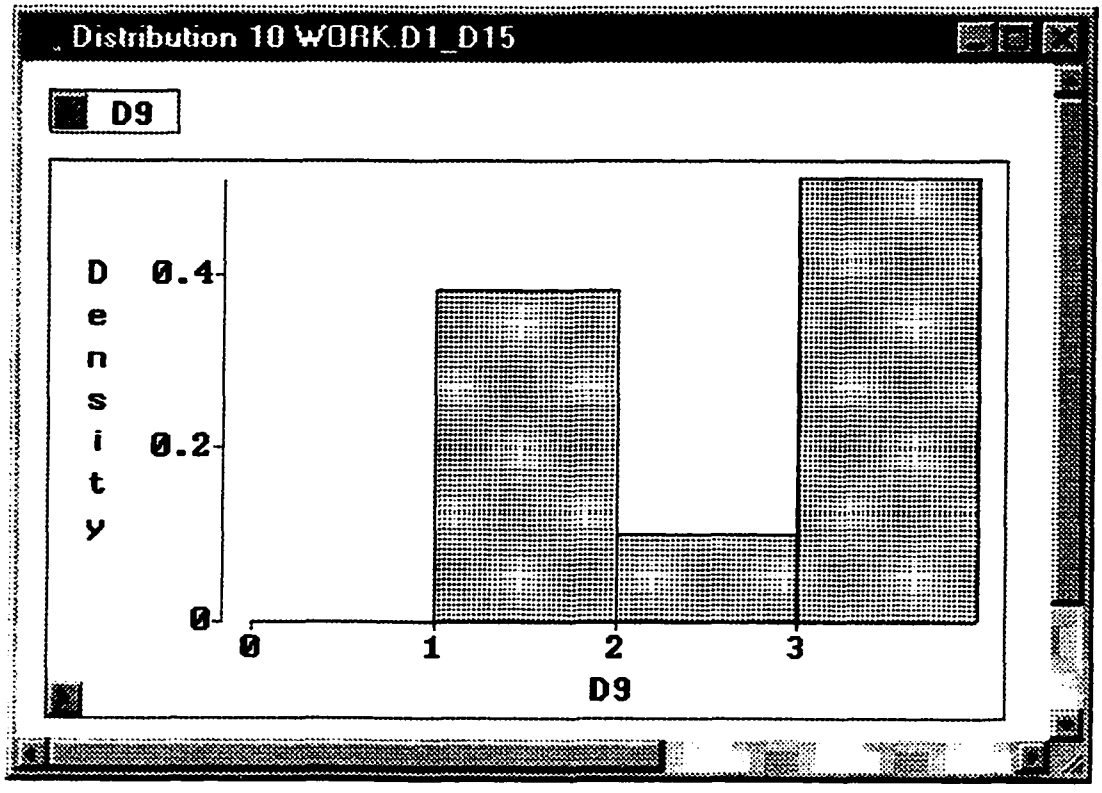

Distribution 6 WORK.D1_D15
D5B
Density
0.2
0.1
0
0
4
8
12
16
20
24
28
D5B

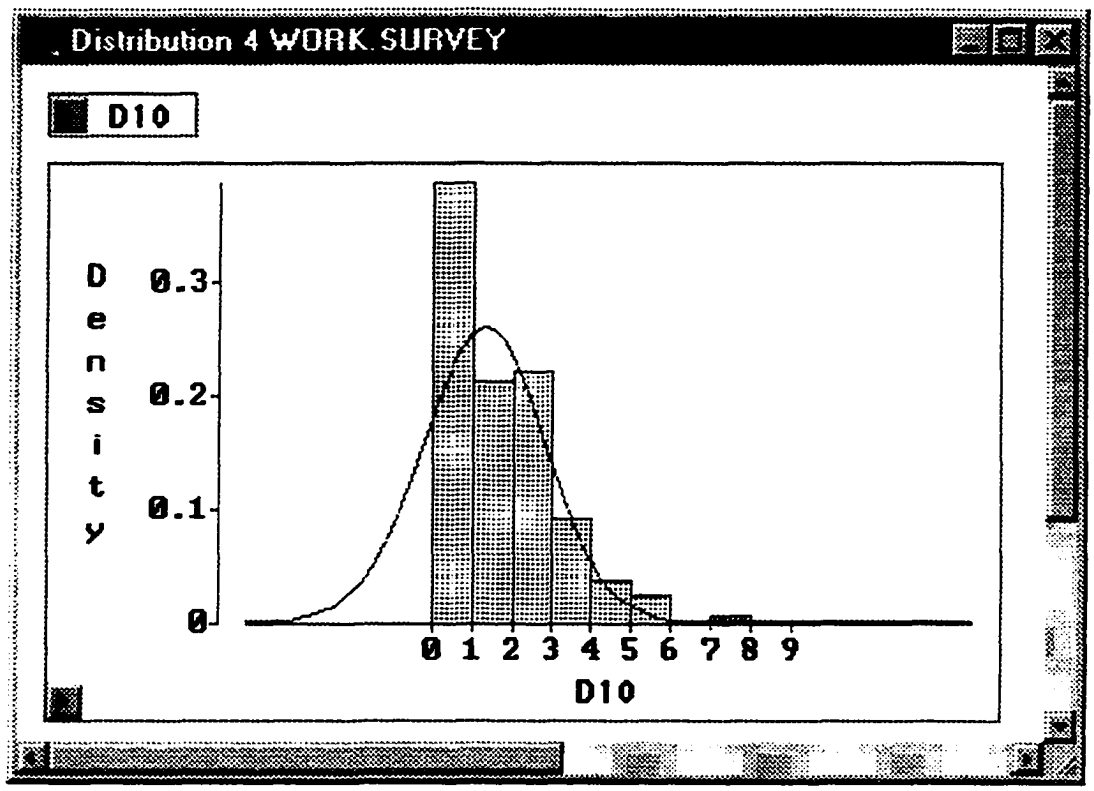

Distribution 3 WORK.SURVEY
D6
Density
0.08
0.06
0.04
0.02
0
0
12
24
36
D6

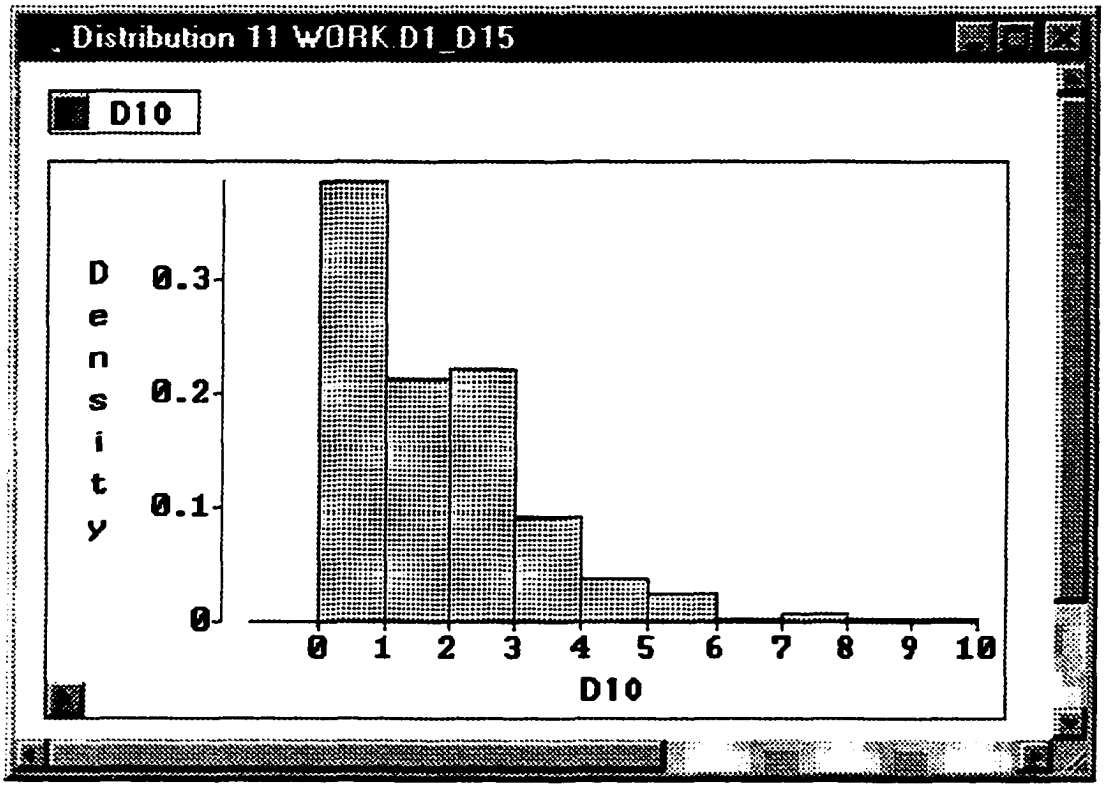

Distribution 7 WORK.D1_D15
D6
Density
0.3
0.2
0.1
0
0 4 8 12 16 20 24 28 32 36 40
D6

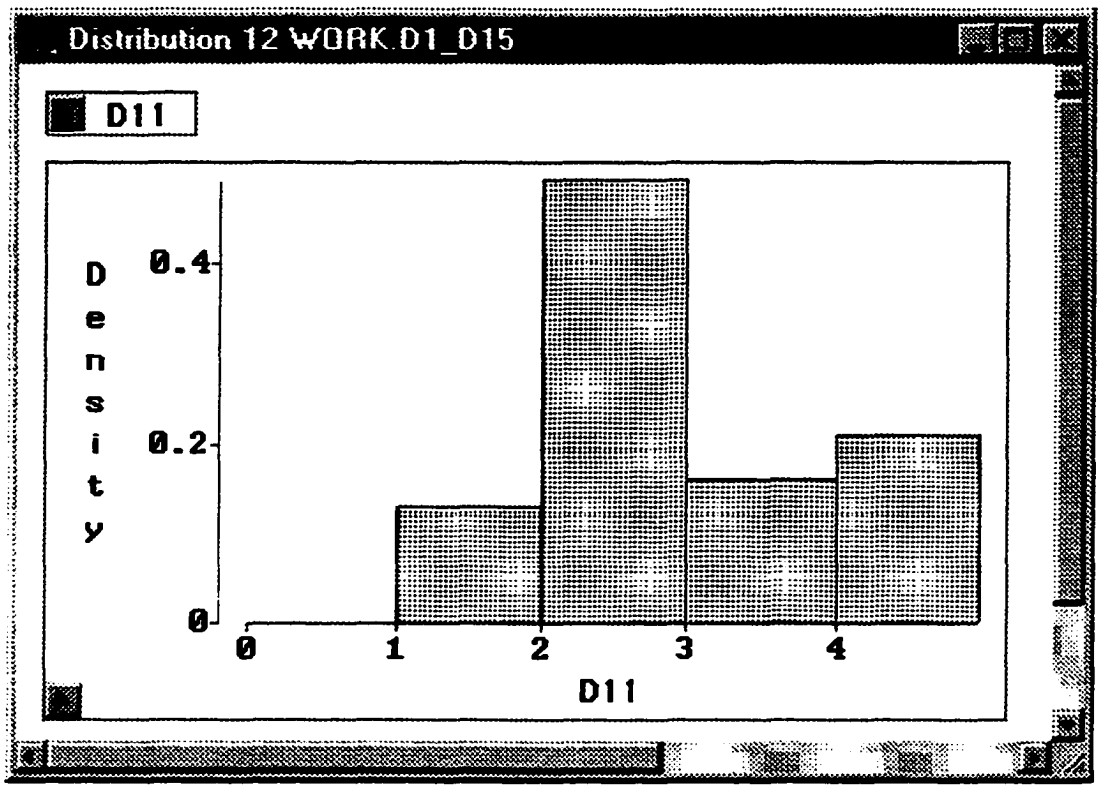

Distribution 8 WORK.D1_D15
D7
0.8
0.6
0.4
0.2
0
Density
0
1
2
3
4
D7

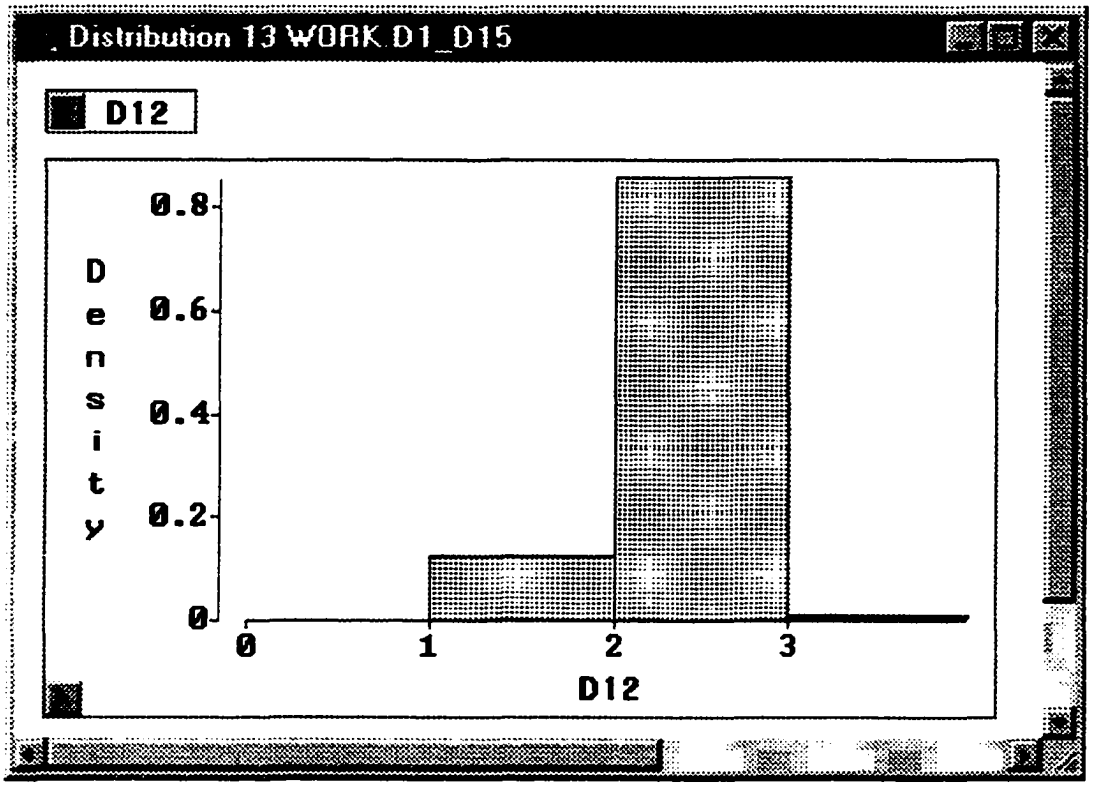

Distribution 23 WORK.D1_D15
D8
Density
0.4
0.2
0
0
1
2
3
4
5
6
7
D8

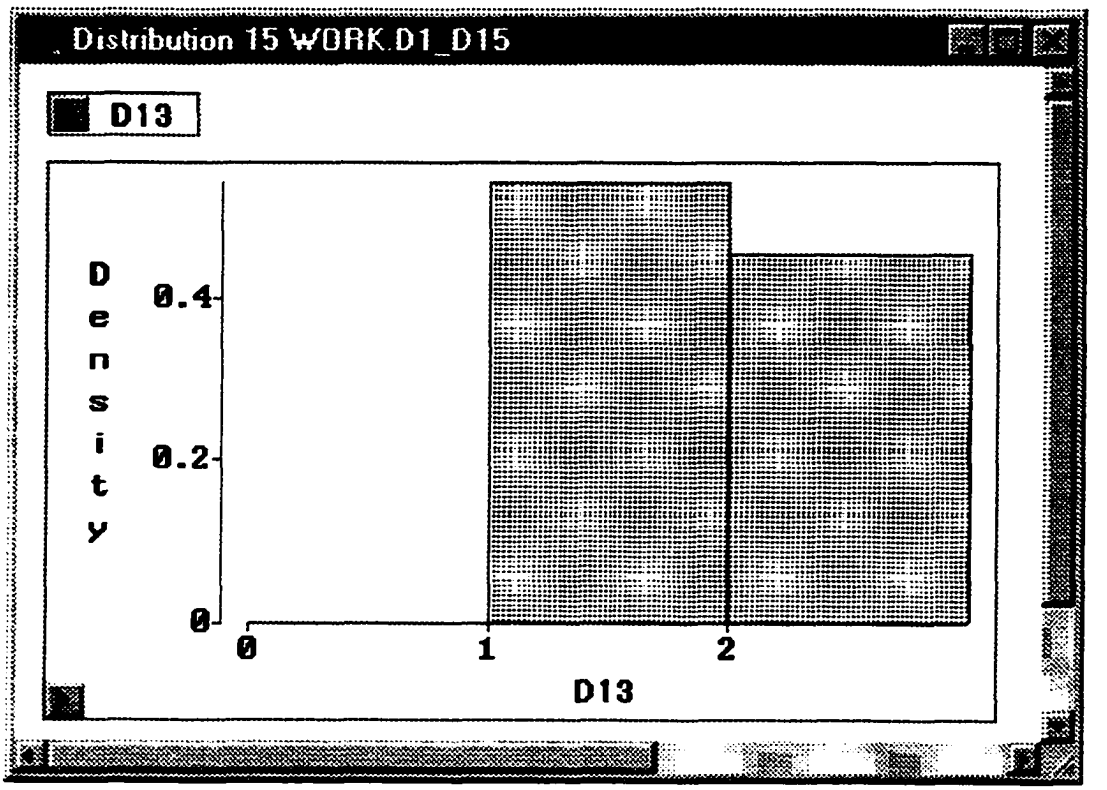

Distribution 10 WORK.D1_D15
D9
Density
0.4
0.2
0
0
1
2
3
D9

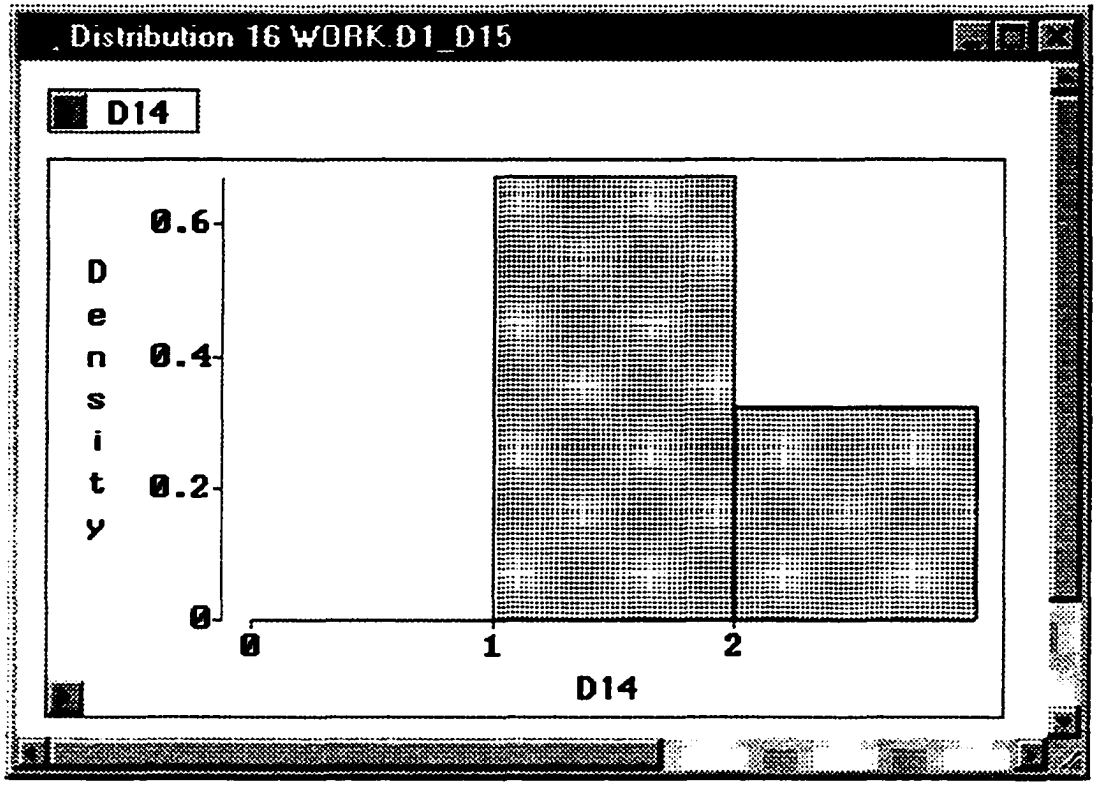

Distribution 4 WORK.SURVEY
D10
Density
0.3
0.2
0.1
0
0 1 2 3 4 5 6 7 8 9
D10

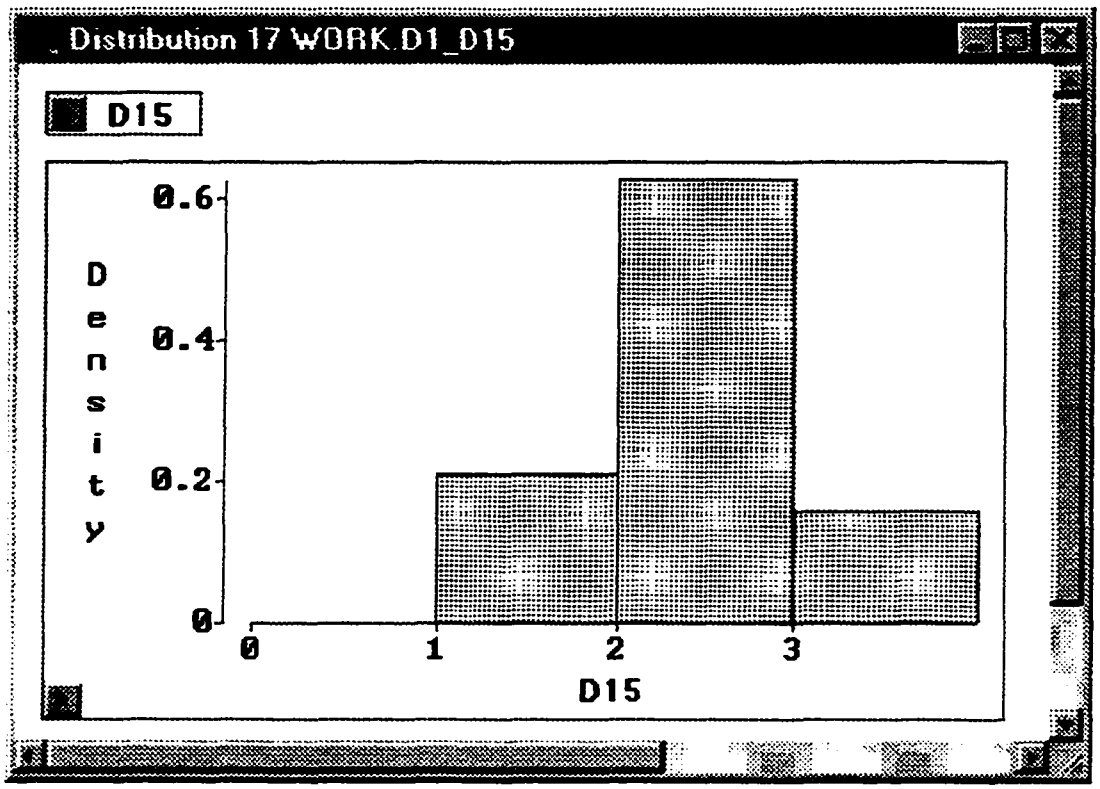

Distribution 11 WORK.D1_D15
D10
Density
0.3
0.2
0.1
0
0 1 2 3 4 5 6 7 8 9 10
D10


Distribution 12 WORK.D1_D15
D11
Density
0.4
0.2
0
0
1
2
3
4
D11


Distribution 13 WORK.D1_D15
D12
Density
0.8
0.6
0.4
0.2
0
0
1
2
3
D12


Distribution 15 WORK.D1_D15
D13
Density
0.4
0.2
0
0
1
2
D13


Distribution 16 WORK.D1_D15
D14
Density
0.6
0.4
0.2
0
0
1
2
D14


Distribution 17 WORK.D1_D15
D15
Density
0.6
0.4
0.2
0
0
1
2
3
D15

APPENDIX K

Qualitative Question No. 44 – Aggregate Responses

What are the greatest obstacles you face that keep you from going back-to-school? (Explain)

No. of Responses marked "no obstacles": 21
No. of Responses marked in nonsensical remarks: 1

No. of Responses Left Blank: 5

No. of Responses marked "Not Applicable": 2

No. of Responses marked "Lack of Interest" or "No Desire": 34

Overtime, I live 56 miles from the plant, other interests at home
Time restraints
Time mostly
Age – already have a trade
Age and having a job that gives me a good income—Lazy!
Lack of time and inconvenience of locations
I have land at Eucha Lake and between working and getting it in shape, I don't have time
Time available—I just don't have the time
The time and energy required that would take me from my hobbies and pursuit of financial gain
No spare time on hand at present
Responsibility to family to provide constant and predictable income
At this point, it is extra time I do not have
My age, time, and interest
Time—church, family, hobbies, sleepiness trying to study and in class
So many other interests
Taking time away from family
After 2 careers, I guess I'm quitting all
Not interested at my stage in life [age]
Family activities, and one vehicle
My own interest at home—involved with 4H/FFA/Redo Club/own horses-training
Time, Age, Desire, Drive and working midnight shift
Desire—as I reach this pinnacle of life [age] I find a degree not necessary, although I still study and attend seminars to up-grade my skills
I have four kids and my time is limited. I've worked midnights for most of my 19 years
Time – and time of day classes as offered
Lack of time
Overtime, volunteer work, family transition to grand-kids

I don't make the commitment for a long-term schedule change (3 to 6 months)
Afternoon shift and my son
Time
The time I would be in school is time I have to spend with my child
Age
Don't want to
Desire
Family responsibilities
Working 7 days work schedule – plus working overtime
Time
Money, time, family, "too old" [age]
Age
I have a hard head—inability to learn from books and retain that info.
Time, being able to spend quality time with my family, and hobbies
Time
Lack of time and scheduling
Lack of time
Have other things going on that's more important [low priority]
Availability of courses, course times, cost of books [scheduling]
Time and priorities
Too much time spent out-of-town due to work-related activities
Lack of confidence—fear of the lack of ability to learn
Age
My age is definitely the deciding factor
Being complacent and also a lack of motivation
For a votech course—such as using your hands—Time is my biggest obstacle—but for a college course—it's pure fear-of-failure
Time
Time
Time
Time, Time, Time
Time
Too busy [low priority] or [time]
Time and work schedule
Age and time left until retirement with the company
Heck of a job schedule and family life
Time
(1) Motivation (2) Every time I take classes it costs me overtime pay (3) Not overly concerned about finances because of savings—investments—and inheritance (not real large)
My children have sports at competitive level (50 games each for baseball and soccer) per year and I coach practice
Family and church – I have to divide my time too much already
I do not enjoy it [previous negative educational experience]
Not enough time

Lack of time
Lack of time
Time and distance
Time – too busy
Age
Time and age
Time
Age – position in plant—too damn tired and sore
No time and no ambition
Retirement
Age and time
Finding time to go and a place and cost
Lack of interest and motivation for traditional classes. Interests in hobbies; recreational activities not available on-site
Time! With the restraints of job overtime and family obligations, there is no time
Interest
Time [lack of]
Working the classes in between things I need to do at home (I am in the process of remodeling a large living room) [low priority]
Being a single parent
Myself
Age
My fear of not being able to understand and learning; too old; I have a hearing disability
Not enough time in the day
Not that interested – no time to do other things
Time and desire
Time – I have other priorities
I work too many hours
I am and have been attending a local community center for the past five semesters
I try to stay involved with my children's activities, during summer and school; when they are older, I have considered "going back"
Time
Age and Retirement
Time
I've live on a farm 45 miles from work. Between duties on-the-farm and the distance from work, there is just not enough time
I commute 60 miles to work and usually work too much overtime. Not being able to participate in the LRC at breaktime [float location]
My own desire to commit to obligations that take up my off-time from work
Getting moved around on-the-job like different shifts that company puts you on when you are half-way through a semester. Also a class schedule that goes half hour over into the time you have to be at work (afternoon shift 3)
Family, distance, and lack of interest
Content with lifestyle at the present time—no drive

Time
Never seem to have enough time. I feel that I learn through informal opportunities like reading, museums, etc.
Lack of time and conflicting hours with work schedule
In a private university—the money ($3,800 a year doesn't go very far)
Overtime and other commitments like having a farm
Age, Time and desire
Went back-to-school first 8 years of working here—now I have other goals
I am currently enrolled in apprenticeship classes and do not have enough time to seek classes for personal enjoyment
Other activities [low priority]
Time
No incentive for job opportunities; no advancement opportunities at work
Not needed
Hinders my time at home [family] and going to church
Time
Having time and the will to learn
My job
Time management, times courses are offered, if what I would like to do is able to meet or match what the company (LRC) offers now—Starting all over again
Family; two years building a new house and upcoming carpool operation
Lack of time and my age
Being the low seniority person in my field and getting "bumped" off shifts frequently, also family
Money and time are the biggest obstacles. Courses offered at work are enjoyable and informative but do little to facilitate advancement without fulltime schooling
Retiring soon; I have too many things taking up all my time [low priority]
Time and need
Lack of confidence and lack of time
Hours at the plant – overtime included
Lack of Drive
Son's sports activities [family]
Time
Time, Other interests [low priority] and My Age
There is really not any except I spend approximately 3-4 hours per day learning "microsoft pro 97"
Retirement in 1-1/2 years
Time
My son is 14 months old – no time
Other interests [low priority]
Lack of time and personal commitment
Spending quality time with my family and the amount of overtime I work
Too tired
Finding time and my spelling is very bad [lack of self-confidence[

Three children and a wife
The number of years since I was in school [lack of self-confidence] and the fact that I work shift 3
Travel from work to home is 31 miles [one way] plus chores at home, and time changes in winter
Knowing what to take
Family responsibilities
Five children and their activities
Family
This is not high on my current priorities
Age – I feel comfortable with my education and hobbies
Child in sports; work schedule, and self-confidence
Prefer not to answer
Time away from family and hobbies
I learn on my own by lots of reading—no desire for structured learning environment
Time
Sleep deprivation [Shift 1] and family responsibilities
Time
Laziness
Time and commitment
I think I have a learning disability—I've never been able to learn from reading [self-confidence]
Working the no. 3 shift makes it bad about going to votech in the evening
Age – almost no one hires people over 50
Busy with home & family
Votech classes are limited in their scheduling
Having to turn down overtime; working and keeping house and taking care of my dogs, and not being interested in most classes
Retirement in six months
Working and keeping home in order
Time restraints and world view bias in so many areas of education
Finding a field in which I could enjoy and make more money
Time
Wanting to be available for overtime because of children in college
Just too busy with other interests [low priority]
Changing schedules
Never developed study habits [lack of self-confidence] and time away from family
I do not have enough time
Farm work and plant work
Time and age
Living outside of the metropolitan area of the plant [50 miles away], getting off work at 3:30pm...having to wait until 6:30p. to start classes...getting home late

Time – combined with shift work
Age
I live 30 miles away from work on a producing ranch raising a grandchild six years of age [Family responsibility]
Don't have the time
Fear and anxiety of the unknown [lack of self-confidence]
I frequently help take care of two of my grandchildren; their father, my son, has custody [family responsibilities]
Lack of self-confidence; Example, ten years ago, I took a writing class and received an "A"—I felt that the only reason I received an A was because the teacher liked me
Time
Age and spouse [lack of family support system]
Age and time
Time
Time due to other interests [Low Priority] and Family
Too busy
Time and no potential advancement in the work place – no carrot dangling out there
Family and aged parents; health of grown child/financial [family responsibilities]
Time – Life – Age
Time and my family
The overtime money I "need" right now
Time
Time
Working too much overtime
I'm raising my eight year old granddaughter; I feel that I need to put her first [family responsibilities]
Time
Having completed my bachelor's degree, I am not in the need of any further schooling at this time
I just don't "make time" to do it—always busy at home [Low Priority/family responsibilities]
I have two college degrees now. I would only go back if there was something I really wanted to take
Age [56]
Time – I have too much to do in too many places [low priority]
Lack of time
I went back and plan on finishing the start of fall '97
Family and job
Don't have any obstacles—am satisfied as is
Shift work is a major constraint
Time
Time, job and kids—also lack of interest (I live one hour away from work)
Raising kids
Not enough time to handle fulltime job and home life plus school
Time – work at the plant; run cattle on my farm

The time it takes away from family activities
Time to go and study
Having time
Raising a family
Doing things with family
Taking time from family and work—turning down overtime
Time constraints (new baby) work, etc.
Low self-esteem
Time and shift work [mostly the shift work—number 3 shift is the worst]
Age—the votech classes I took years ago are completely out-dated. I feel I will just take the classes I need "when" I need them
Energy, time, self-doubt, fear, lack of memory, money, will-power, and age
At this time there are other things that have to be taken care of first [low priority]
The shift I work and time to go
Knowing, for sure, we have little time before the revealing of the Lord Jesus; I devote my time to things of eternal value instead of temporal (Bible reading, prayer, fasting)
Don't have the time
Single parent – young family and off-shift work
Time
Job and having to drive a long distance
Family
Overtime and my child
Time
Time and lack of interest
Family obligations; desire to be at home with wife and children; TIME!!TIME!!
Cost of living
Time away from family and personal obligations
Desire
No night classes at the private university in my degree program
Class scheduling at the Junior College closest to the plant
Time
Finding Time
Family – the more classes that are taken—the more you have to study, therefore, less time with your family
Taking time away from my family and too much overtime
I really don't have any major obstacles to keep me from returning to school—it is just taking the first step
Age—almost ready to retire; I've had enough of this company and ready to get out!
Time
Time & other interests [low priority]
Time – Father in nursing home and requires a lot of my time [family responsibilities]
I have my own business plus I work here [low priority]

Family
Children involved in competitive sports
Time
Age
Not enough time; too many obligations with family
The time and need
Time and money
Lifestyle and work
Illness in family
Lifestyle: too much going on with work and time with family

Qualitative Question No. 45 – Aggregate Responses

45. What would make it easier for you to go back-to-school? (Explain)

51 responses left this question blank

20 responses marked: "Nothing"

4 responses marked – "Not Applicable"

1 responses: "currently attending classes"

4 responses: Marked in 'nonsensical terms' [i.e., someone to go for me, **or** Win the lottery, to be young again]

10 responses: Marked "?" or "Don't Know"

Interesting courses at Votech.
More flexible scheduling; have enrolled in many classes that were cancelled & wasn't informed; **if the company supported the students more**
30 years younger (age)
If I were to Lose this job—I'd probably would wish I had taken advantage of it.
On-site classes dealing with a trade or license opportunity
Chance of Advancement
It's pretty easy—if I wanted to
More hours in the day – or a change in my priorities, as to the allocation of my **time**
Having spare time
If spouse would work and make income to help long-term
To enroll and go
A need
Your [on-site advisor] encouragement has been wonderful
A desire to do so
Deciding what to take – time
A desire to learn something pertaining to what I may go to in the future
Be able to get off the job
If I were young again [age] I would jump in with both feet
Money, definite gains and good changes because of having gone back
Need motivation
Making the time is the thing. Maybe I can go back-to-school in a year or so
Retirement
More free time
Convenient locations, times & days of week and restructuring my priorities in Q.44
After retirement, I will seek another vocation & attend school
More hours in the day [lack of time]; class availability
No child
If the company would pay salary

Not having to work 40+ hours each week
Bring class to workplace – after work
Classes that interest me
More money, more time, fewer family obligations, and younger [age]
To be 20 again [age]
Desire and more time
If I knew it would help advance my career at this plant
Time from job
Stop working overtime—get rid of an ex—[will be soon]
More pay and less hours
A full four year institution in the Tulsa area
Reset personal priorities
Different scheduling opportunities
If my concentration were better
If I went to school, would have to give up hobbies/family [Low priority]
Too late now
It's easy now
Retirement—then go into a field I enjoy
Not to have to work for a living
A raise in pay with less responsibility
(1) Knowing what I would like to do and (2) having more time—right now too many working hours and family commitments
Not having to work
Work days (referring to shift work)
Less to do and more time
More time and different shift
Interest in going back-to-school
At this time in my life, there are so many things going on with curch, children's activities—it's almost impossible
Less time spent at work
Nothing really, just not interested in going to school at age of 57—lots of other things to do: fish, hunt, have fun, Right??
More free time
I just can't seem to say "No" to overtime opportunities, working day's off, in general (taking care of present instead of being concerned about future)
When my kids graduate (17 and 14)—they are more important now than my education until they graduate
Something else in my life would have to go (change in priorities)
No job and a desire to go
How to make more time
28 hours in a day
Being on day shift – five day work week
Time off from work
Desire

Time
Time
Classes offered to off-shifts
Easier job in plant
Work fewer hours
Hobby
Being younger [age]
School closer to work or home
More on-site classes
Living closer to work location and knowing I wouldn't have to work overtime
If I can develop a real interest at this time
Better class schedules
If I had most or all of my work done at home
The need—my job
Being smarter in studying and a smart tutor [lack of self-confidence]
Shorter work week
Better time management; someone to do everything around the house
More free time plus the opportunity to advance with the company
Finally making 'the decision' to put education as a top priority in my life
Shorter days
Job opportunities, pay incentives, I see mainly salary, but some hourly taking classes during work hours on days. Privileges of work groups, task forces, and other "get off-the-line" jobs, are only day shift employees. Midnights and afternoon shift workers are forgotten.
Time
Give up other personal activities—which I don't want to do
More available time which I don't have
Classes starting at my shift's end. Correspondence courses and better overtime scheduling.
Wanting to and the need
If I didn't have to work
More time
No job and no family
Time
More time
Not interested in returning to school at this point in my life
Mail order courses which isn't offered here at the company
More money
Less overtime
Desire
Time is the largest obstacle. My family is No. 1 time consumer then my job is 2nd
More time
Desire or need
If they offered courses other than on church nights—and on campus courses (need more on-site at plant courses)

More time
If I could find something that I enjoy
Opportunities to advance in job
If the company would give the opportunity to advance in the corporate system with the proper education—with fair and impartial opportunities
More personal free time
Not have to work
Working one shift consistently
Stop living it up so much—stop having so much fun [low priority]
Need something to help me become a veterinarian
Ph.D. program offered closer to metropolitan area
More time
I would have to want to
For me to understand a real need
Having time to go to school, fulltime—part-time means no-time
During work on breaks or split shift
Just finding the courses that are of interest to me
Have my kids graduate from college so they can be secure
If I would take time to enroll in a spelling course to prepare myself
No Need to go back-to-school
Being single [family commitments]
If I worked another shift other that shift 3
Classes I'm more interested in such as furniture refinishing
Lack of motivation
If I had a nanny to help with our five children
Dependable child care
Wanting to
If I didn't have a family
The learning center [LRC] is all we need
More varied courses on property
Prefer not to answer
Expanded financial assistance to include cost of books and even parking
Less overtime and less to do at home [family]
Day shift and all kids grown up
More hours in the day [time]
Family and motivation
More time for school
Classes geared towards slow-learners [self-confidence]
Being on Shift No. 2 [days]
Be debt free
Certain votech classes are only in the morning; they also need afternoon and evening classes
One or two days a week early afternoon flexible schedule but any 2 days at my choice
Being 20 years younger [age]
Need for less money and some free time and knowing what I would like to do.

Correspondence Courses
More hours in the day—we all need that and finding something to stimulate my interest enough to make me take classes
No dependents
My kids being out-of-college
Having the desire or motivation
Lay-off
Guarantee of me being able to use the education in which I am obtaining [relevancy and job-related]
Scheduling
Knowing what my interest is
Getting my children through school first
Give up something I'd rather do [Low Priority]
Classes held closer to quitting time, also, obviously, classes don't cover so much in such a short time frame. For example: 10 week course held one night a week covering hydraulic and pneumatics or computer applications and time covering Wordperfect, Lotus I, II, III, Database, etc.
Regular non-rotating shift
Move close to the plant [now a 50 mile trip one-way] and give up my grandchild—his learning comes first for me—he is only six years old
If I didn't have to work
More time for me
If I could spell. Sometimes my mind goes blank and I can't even get close to the correct spelling [Lack of self-confidence[
Be retired
Be at least 25 years younger and wiser [Age]
Help at home [lack of family support system]; we would have to cut out other businesses we have [Low Priority]
Stop other things in my life that I love—chaplaincy, ministry, counseling [Low Priority]
Desire
More free time
No family
More time
On the job site—can't get easier than that
No Money Problems – and better study habits
Home classes or shorter classroom time
Enroll in a course that I really want and like to do—but can't think of one now!
If, where I was going for school, had an on-site child care
My kids grown up [family responsibilities]
If I were going to change jobs/vocations—then I would seek the necessary schooling
Desire
Personal time off from the company to attend programs "out-of-state"

Time
If I had more time
Taking a leave of absence from work
I have no interest in school; I am not a reader; don't take time to—my family is 1st
Being "only" a fulltime student
Kids growing up [family responsibilities]
I live 30 miles away from the plant—if I was closer to a school—then I could carry on my major
If college classes were offered in the LRC [on-site] right after shift
Reduced debt ratio
More free time
Classes that fit my time schedule
Not being on shift 3—the LRC has made it easier
A need to know now and be able to put it to use now [relevant]
To find out why I cannot learn and retain what I learn [lack of self-confidence]
It would be easier if I were on the same shift longer;I get bumped around shifts a lot
Less overtime and less outside activities [low priority]
If I didn't have to work
No family and no job
To have something closer to home
Fulltime job for my wife and my child finishing school
Support from family is my main concern
More money
Loss of my job
Flexible work schedule – like a work co-op program
More of the courses available at the local junior college downtown campus to come to a campus closer to the plant site
Too much going on with family
High self-esteem [lack of self-confidence] and Time
A divorce [lack of family support]
Less overtime and a real desire to go back-to-school
I don't know if I can [go back to school] or not [lack of self-confidence] age-related
Better teachers
Time and need
On-site classes
More free time
If I didn't have to work here!
On-site accredited classes
Children graduate
Sell my boat and fishing tackle and give away five children and 8 grandchildren
To be retrained for a new job
To have the time
Time and money
On-site college classes
Time
To be single again [family responsibilities]

Qualitative Question No. 46 – Aggregate Responses

How long has it been since you attended school (for example, high school, college, votech)

_____Months _____Years

Name or type of school last attended:
Name or type of course last taken:

(a) **How long has it been since you attended school and (b) Name or type of school last attended, and (c) Name or type of course last taken:**

3 Responses – Left Blank

Years	Months	Name/School Type	Last Course Name/Type
3		Votech	Study Nat'l Electrical Code
25		Junior College	Liberal Arts
15			Computers
40		High School	
36		High School	
40		High School	
40		High School	
	One	Votech	Backflow Prevention Certificate
8		On-Plant-Site	Small Engines/Votech
29		4 yr State University	General
27		4 yr State University	
4		Adult Ed. Evening	Stock Market Basics
16		Junior College	Computer Programmer
14		Drafting College	Welding
30		High School/Votech	Machine Shop

Years	Months	Name/School Type	Last Course Name/Type
1		2 yr State College	Marketing
Now		4 yr Private Univ.	Business
20		4 yr State University	English
37			
40		Jr. College at night	Variable Frequency Drive
2		Junior College	American History
23		College	Computer
22		High School	
27		Votech	Machinist course
40+		Military Training	Aviation
28		Junior College	
7		Votech	Auto Body & Small Engines
32		Votech	Electrical & Mechanical
20		Junior College	Pre-Major Requirements
	Months	Integral Devel.Instit.	Addictions
20		High School & LRC	LRC-computer class
23		4 yr State University	B.S. and M.S. earned degrees
33			
42		Charleston	
9		Jr.Col.& Apprentice & LRC on-site	Electrical courses/Apprentice Internet Course in LRC on-site
1		Votech	Apprenticeship courses
2		Votech	

Years	Months	Name/School Type	Last Course Name/Type
2		Real Estate School	Board Certification Examination
24		Trade School	Plumbing
Years		Private Trade	Welding
40		High School	
Many		Votech	Computers
31		High School	
	Six	Votech	Auto Body Repair
2		Votech	Small Engine Repair
28		High School	
Years		On-site @ Plant	Small Engine Repair
20		4 yr State University	Psychology
47		Jr. High School	Required (completed 9th grade)
Years		High School	Math class
11		4 yr State University	Money & Banking
1	+ 8 months	Junior College	English Comp.. II
5		Votech	Interfacing (micro processors)
	Six	Votech	Code
19		Learning Rec. Ctr	Computer Course
	One	4 yr State University	Biology/Environmental Prob's
	Twelve	On-site at plant	Weight Watchers
20		Votech	Electronics
12		Votech	Air conditioning & Heating
	Six	Junior College	Excel (computer class)

Years	Months	Name/School Type	Last Course Name/Type
4		Votech	Welding
1-1/2		Votech	Small Engine Repair
37		4 yr State University	Industrial Arts
Years		High School	
6		Ferrier College	Horse-shoeing
34		College	Digital Electronics/Secretarial
25		High School	
Years		4 yr State University	
	Two	Votech	Beginners Finishing Carpentry
35		High School	
2		Junior College	
22		High School	
4		Jr. College & Dale Carnegie Course	History and Psychology
15		Jr. College	Police Science
28		Votech	Aircraft Mechanic, Land Designer, and Computers
5-1/2		Private University	Christian Ministry Courses
1		Votech	Electronics
4		Junior College	English & Computer
	One	4 yr State University	Master's Management Program
25		4 yr State University	Arts
24			
4		Co. Training& Dev.	Computers and math refresher

Years	Months	Name/School Type	Last Course Name/Type
21		Junior College	Can't remember
6 – 7		LRC on-site	Math
13		Junior College	Accounting
25		4 yr Private Univ.	Business Administration
4		ETAP on-site	Welding 1, 2, and 3
40		High School	
10		Votech	Auto body
22		College	Accounting
36		Votech	Electrical
26		High School	Artificial Insemination (Cattle)
35		Votech	Diesel Mechanics
35		High School	Required
2		Votech	
22		4 yr State University	Management
29		4 yr State University	Computer programming
12		Votech	Transmission course
6+		LRC on-site	Photography
25		Votech + Pilot Lic.	Industrial machinist
25		School of Religion	How to Witness
	One	4 yr State University	Advanced Tax
	Three	Votech	Reliance on the GV3000 Drives
4		Votech	Auto

Years	Months	Name/School Type	Last Course Name/Type
Years		High School/Votech	Small engine
42		High School	High School classes
30		Junior College	Accounting and English
23		4 yr State University	Biology
17		4 yr Private Univ.	Business Administration
30		4 yr State University	
2		Junior College	Human Resources/Business
35			
	Two	Junior College	Computers & Personal Finance
22		High School	Building Trades/Votech
28		Votech	
Years			
	Two	Votech	Metallurgy
10		University & LRC	LRC: Computer technology
5		Votech	Welding & Metallurgy
20		Junior College	Machine Shop/On-site welding
39			
1-1/2		Junior College	Marketing
8		Junior College	Introduction to Windows
32		College (one year)	Business
40		High School	
9		Votech	Paint and Auto Body Repair
12		Junior College	

Years	Months	Name/School Type	Last Course Name/Type
5		Votech	Lawn Mower Repair
	Current	4 yr Private Univ.	Legal Environment in Business
5		Votech	Apprenticeship/Metallurgy
Years			
1+		On-site at Plant	Cutting & Routing System Sch.
15		Junior College	Statistics
15		Junior College	Technical Math
Years			Welding
Years		LRC on-site class	Computers
10		4 yr State University	General studies
10		On-site PDA class	Small Engine Repair
Years		Vibration School	Vibration Course
		Votech	Welding
20		High School	Basics
3		Police Academy	
5		Votech	Accounting
40		High School & LRC	LRC/computer
Years			
2		Votech	Mechanical/trade courses
11		Junior College	General Education/Basics
2		Junior College	VCR Repair
4 or 5		LRC on-site	Computers
30		Votech	Air Conditioning/Refrigeration

Years	Months	Name/School Type	Last Course Name/Type
21		High School	
5		On-site/PDA	Small engine repair
25		High School	
Years		4 yr State University	Human Relations
35		9th Grade	Didn't finish high school
54		Intermed. High Sch.	Left school at 14 yrs of age
21		4 yr State University	
30			
Years		LRC on-site classes	Computer & small engine repair
5		Junior College	Statistics
	Four	Junior College	Statistics – Grant Writing
4		On-site ETAP class	Spanish
5		On-site/PDA	Photo./computers/sm. Engines
6		Junior College	Supervisory Management
25		Votech	Auto. Mechanices
21		Junior College	Management
33		Seminary	
12		Votech	Heating and Air Conditioning
38		High School	
39		High School	
4		State College	American Government
Years		4 yr Private Univ.	
20+		High School	

Years	Months	Name/School Type	Last Course Name/Type
2		PDA class @ Union	Concealed Weapon License
5		Votech/Apprentice	Vibration class
28		High School	
20		High School	
21		High School	
3		Votech	Appliance Repair
40		College	Agriculture
	Three	LRC/on-site classes	Windows 95
37		High School	
	Months	4 yr State University	Environmental & Management
10		On-site class	Computers I & II
21		Junior College	
25		High School	Reading and Math
20		Junior College	General
	Three	4 yr Private Univ.	Accounting
1		On-site PDA class	Large Engine Repair
32		Votech	Technician
30		Votech	Pipefitting
37			Did not finish High School
	Months	Votech	Auto Refinishing & Auto Body
34		High School	
6 +		Votech	Welding
25		High School	

Years	Months	Name/School Type	Last Course Name/Type
40		High School	Took Reading at LRC 3 yrs ago
30		High School/& LRC	LRC: Robotics & computers
40+		Didn't Grad. H.S.	Woodworking
30+		Completed GED	Woodworking I & II On-Site
8		Local Church	Pastoral Training
24		Junior College	General courses
28		A & M College	Basics
Few Yrs		Junior College	Can't remember
25		Didn't complete HS	Basic House Wiring/On-site
8		State College	
15		College	
11		Junior College	English & Psychology I
1		Junior College	
22		High School/OnSite	Welding/PDA/Computers/LRC
20		High School	Insurance & Carpentry Finish
23		4 yr State University	
30		High School	
12		State College	Computer Applications
27		4 yr State University	Pre-Pharmacy
40		High School	Job-related course
10		College	Computers and Business
Years		On-Site @ LRC	Computer Class
25		High School	Required for diploma

Years	Months	Name/School Type	Last Course Name/Type
	Two	On-Site at LRC	Windows '95
2		Votech	Sewing
25		Did not finish H.S.	Beauty College
Many		School of Accnting	Cost Accounting
17		4 yr Private Univ.	Business Administration
3		On-Site/LRC	Computers
35		Votech	Drafting
2			
31		High School/votech	Radio/Elec & TV/Indus.Elec. And Speed Reading
1		Votech	Plant Lay-Out
37		High School	Flower Arrangement
20		Votech	Welding & Machinist
23		Junior College	Marketing and Business
36		High School	
	Two	On-site LRC	Introduction to Excel
18		High School/Votech	Welding
18		School of Business	Business and Accounting
4		State College	Computer Classes
35		High School & LRC	Beginning Computers
20		Votech – Got GED	Health Insurance Clerk
Many		Votech & LRC	Computers at LRC On-Site
12		Junior College	Technical Math
24		4 yr State University	Marketing, Bus.Adm., Accnting

Years	Months	Name/School Type	Last Course Name/Type
30		High Sch./on-site	Art Class/PDA On Plant Site
9		Votech	Drafting
30		Votech	Computer Programming
43		High School	
22		College	
31		College	Requirements for B.S.
17		Climate Cont. Instit.	Air Conditioning & HAVC
	One	Votech	Programmable Logic
	Months	Junior College	Social style
25		Junior College	Accounting
20		High School	
6		Votech & LRC	Math and English
17		High School	
25		High School	
Years		Votech	DC Electronics
28		4 yr State University	Agriculture Economics
6		Junior College	General Requirements
17		Junior College	Marketing Related
28		4 yr State University	Education
20		High School	
33		High School	
30		High School	
6		College	Supervision

Years	Months	Name/School Type	Last Course Name/Type
1-1/2		4 yr State University	Elementary Education Reqmts
30		High School	
2		Junior College	Human Relations/Bus. Math
5		On-site/PDA	Outboard Motor Repair
31		High School/LRC	Program '95 in LRC
5		Votech	Machine Shop
Years		Welding School	Metallic and Non-metallic Bonding
20		High School	
40		Did Not Comp. H.S.	History
20		College	General Ed. Courses
	Five	Votech	Auto Body Repair
20		Votech/Trade Cert.	Micro-Instrument Repair
30+		High School	
26		Junior College	Bookkeeping
15		Votech	Drafting
27		School of Aeronautics	Airframe, Power Plant and Radio
	Enrolled Now	Junior College	Nursing
1		Votech	Welding Course
	Three	Votech	Back Flow Prevention & testing
	Ten	Votech	Upholstery
	One	Junior College	English Composition II
2		Junior College	Quilting

Years	Months	Name/School Type	Last Course Name/Type
18		GED	GED
22		High School	
3		Junior College	Computer Course
15		Junior College	2-Dimensional Drawing
36		High School & PDA	On-site Flower Arranging
25		Junior College	
45		High School	
Years		College	General
2		Junior College	Political Science/English
Years		Computer School	Don't remember
20		High School	
	Two	Votech	Metallurgy
19		High School/Votech	Auto Mechanics
18		College	Can't remember
	One	Votech	Welding
3		On-Site/PDA	Small Engine Repair
31		High School	
25		4 yr State University	Math and Education
	Months		Music
Years		Junior College	
11		GED	GED
27		GED	
	Six	LRC/on-site	1st level computer course

Qualitative Question No. 47 – Aggregate Responses

What would motivate you the most to "go-back-to-school"?

No. of Responses Marked "Nothing": 21

No. of Responses left blank: 48

No. of responses marked: "Not Applicable": 3

No. of responses "marked in nonsensical terms": 2 [i.e., A return of my youth]

"I Don't know," "I'm not sure," or marked with "?" =No. of Responses: 27

Fall or winter **classes that interest me**
If **it would lead to advancement and higher pay** at work.
Courses that would lead to a better quality of life
If the company informed me tomorrow that in a year, we were going out-of-business; I would go to school
Increase in pay for completing approved courses
More time
Chance for advancement
Financial Need
Completion of self goals set at present time
If the skill I learned would be a benefit to the company and provide higher income
Time
Once daughter is out-of-college
Something in hobbies or crafts
Learn computers for home use
Loss of job
Opportunity to make more money, working hours
A desire to learn something pertaining to what I may go to in the future
Lose job
Be able to get off my job to attend class
Youth [age]
New Horizons for the better of all around me
Job enhancement
If company pays—have the things I like with the times and people to fill the on-site classes
Courses for personal enjoyment—but not to work toward an advanced degree
Having more free time
Positive motivator: compelling opportunity of service or financial gain and
Negative motivator: Death in family; forced career change
A degree opportunity
An Art course
I have already decided to start back-to-school this fall

The opportunity, more available time
Loss of present job – share class with a family member
More time off of work
Chance to make more money, easier work and better working conditions
Time to roll back [age]
If I had ability to retain what I read—Better Memory
If there was an opportunity to advance my career—and there isn't!
Time
Advancement
Desire
A full four year institution in the Tulsa area
If the company would pay you more the amount of education level that you obtain
Job security [lack of would motivate]
Self-motivation and job enhancement
The ability to make more money by improving my education
If I had the ability to concentrate and retain what I read
Loss of job
The chance to earn more money
Retirement
If I ever figured out what I would like to pursue as self-employment
Money
Maybe if I had someone to go with to that first course (college) and take it with me, plus "time"
More time
Something I could apply in my every day life [relevancy]
Interest in a course or subject
Losing my job
Pay for aircraft Pilot School
To know I would be able to put some of the knowledge to a good purpose [relevancy]
More time
Personal knowledge
Change in priorities – not enough time for everything
If it was a matter of keeping my job
Company mandated
Increased income from going back-to-school
Time
Time and convenience
Something that I was interested in
If, as a result of taking classes, I could change jobs in the plant
More time
Keep my job
Time, convenience, and money
Job requirements in computer usage increase
If I could come upon something that really peaked my interest
Advancement and retirement income (plan to retire at 50 and seek new career)

I really don't know yet, but when it comes time to "go-back"—I will
Tax
I feel at my age and hearing disability that my schooling is past-tense
I would like to be able to take some Spanish classes with my wife
Not working; Doing something different after retirement
More free time plus the opportunity to advance with the company
A chance to obtain a Degree in something I enjoy [like Wildlife Management]
I have worked at the plant for almost 18 years as a glass handler. I feel like I'm in a deep rut. I have lost my motivation.
Loss of job security
Opportunity to make more money or job advancement; Opportunity to work at something I "really like to do," (outdoors, wildlife)
I would like something pertaining to my job. If I could schedule my time to attend classes.
Certainty of job loss or a course in something I would "want" to take like an engine repair or body shop class
If someone said I had to to keep my job
If the company was more understanding with scheduling
Lose my job
Necessity for future job security
Requirements for a new job
Desire for my skills
When I feel the need – Desire
After completing my current training, I would like to specialize in Computer Process Control
More time
Better pay or job
Going on company-paid time
Courses offered on non-church days
Advancement in job
Because the company pay and benefits are "so good" they need to offer internal advancement
Be active in an operation that, after retirement, would require greater education—such as in-depth computer knowledge
Need; then I would be more likely to sacrifice my time with family
"A swift kick in the seat!"
If I could find some time and stop spending my children's inheritance
The need to change my vocation
Type of course (Veterinary)
Ph.D. program offered closer to our metropolitan area
The right course and time
If I could go back after I retire from work
If I could get a better job in the union and it would have to be on shift #3
Pay increase
Ability to attend fulltime
Knowing it would help me in my interests

Taking time from personal problems
I will go back-to-school when my kids graduate from college
New career—something I would enjoy
Making more money
A course that interests me
Interest
More time
More available time and less responsibilities
If it were a requirement to keep my present classification
Loss of job
I feel I am too old to go back-to-school, set in classes and be interested
Some goal
Prefer not to answer
Loss of job at this plant
Loss of job
Course would need to be useful to me for work or home [relevant] and convenient location
Time off from work to get things caught up at home
A very large wage increase
Loss of job – or need to keep present job
More free time
I'm getting too close to retirement to care
Time and different shift
Saturday votech classes would help
Very interesting class and flexible scheduling
After 25 years of retirement (the Good Life)
Knowing I could start some successful business—or something I really enjoyed
Classes that would help in bringing people to Christ
Losing this job
No job
"Dine-no-might"
A chance to get a promotion at my current job
A major life-style change
Time – two fulltime jobs is enough
Loss of this well paying job
With my current life-style, I couldn't [Low Priority]
If I would lose my job
Loss or possible loss of job
Would like to get a degree in some computer classes
More confidence in myself
To study the essentials and skip the basics and computer literacy
Need for better pay
Not having such a full plate
Opportunity for Advancement
More time
Money

No job, maybe
If I had to change my job
To get paid a stipend or receive a job-related raise or promotion
Classes that really interest me
I would like to attain a couple of years college so I could advance in my job
More time and job advancement opportunities
If a new job required me to have the additional schooling or if I wanted to take a votech type course to learn a new trade
"Just to do it"
If I had to brush-up to get a job
Time off from the Company to attend two week programs
If this plant is sold and I need to go back to school to get another job
Necessary for a job change
Something that "really interests me" such as art or woodworking for supplemental income in retirement
On-site college credit classes
If they close this plant
To work in a field that really interested me
No job
Have no desire—did not enjoy my school years at any level [past negative educational experience]
Being able to go to school "only"
I would love to go back-to-school—time is my only obstacle
Self-gratification—just to say I MADE it or I got my B.S.
If I was laid-off and could go during the day to keep evenings free
To complete an associate's degree
Need for a job or advancement
Job opportunities
Not interested at this time
A lay-off
To better myself and family
Course being job-related
A need to know and do my job or a hobby that I am interested in
Lose my job, health and have courses that are easy and I could pass them
Advancement at job and more pay
Loss of Millwright Classification within our corporate system
Easier schedule for me and courses I might want to take
To have something offered closer to home
40 hour week job
I would be motivated to continue education now—if I felt that my family could survive it
More money to take care of the high cost of living
To up-grade my skill license from a journeyman to a contractor
Offer job advancement
The courses I want more convenient to my home and/or work
To have a chance for an "air-conditioned" job

Making sure I could schedule classes that would fit into my lifestyle
A speech class to help me pronounce my words correctly and talk better
Lay-off to free up my time
Need
Time
Money

Qualitative Question No. 48 – Aggregate Responses

Have you made plans to take a votech class, attend a workshop or seminar to learn a new skill or trade? (for example, learn new machine skill'; learn to operate a computer; take welding short course, etc.)? Yes____ No____ If yes, please describe.

(a) Yes - Describe

1 – I am thinking of taking a class in upholstering for my own personal use.
2 – Need 4 more classes to complete apprenticeship
3 – Excel and Word Computer classes
4 – Currently taking windows 95 at Learning Resource Center [on-site]
5 – Computer Tech.
6 – I am nearly always doing informal study
7 – Went to workshops & seminars to gain supervisory promotion; also qualified me to teach adult education classes and training seminars
8 – Greenhouse Management
9 – I'm going to start working on an Associate Degree in Computer Science
10 – Through the LRC and Votech classes
11 – Didn't specify type of course
12 – Will probably go to local junior college in fall '97
13 – I have been and continue to attend seminars, workshops and other classes for job and union related improvement
14 – More computer classes
15 – Computer training
16 – All the time—computers, leadership workshops, Facilitators Conference for small groups
17 – Votech; License for Air conditioning Contractor
18 – LRC – Computer Basics
19 – Ph.D. in Votech Ed. Or Ed.D.
20 – Editor's conference in Sept. & Accounting Info. Systems in August
21 – Men of Purpose
22 – An on-site generator class
23 – Continue classes on-site and at votech for apprenticeship program
24 – I missed the first CAD course offered. I would very much like to take that type of class & basic computer courses. For any schooling to be effective, you must have practical experience to retain what you learn. I think after you take CAD, the company should offer opportunity for use.
25 – Working on a certificate program to teaching Modern Doll Painting. I have my antique certificate in Doll painting and will continue towards my Master's next year.
26 – Computers
27 - Marketing
28 – Computer Process Control
29 – Generator Repair – On-site
30 – Computer (repair and build)
31 – to train at local junior college in soft skills

32. – Attend workshop on machinery analysis "Vibration"
33. – Access course at local junior college
34. – Self-employment
35. – Access
36. – Small engine school which I enjoy very much
37. – Generator repair class on-site
38. – Auto-body repair when four year degree is achieved
39. – Computers, financial class
40. – In conjunction with the apprenticeship course
41. – Auto Body Collision II and Auto Refinishing I
42. – I have been talking to my wife about carpentry school at votech—this would be my heart's desire
43. – Computer and Foreign Language
44. – More about computers
45. – On-site computer classes
46. – Welding
47. – Learn to Operate a computer better
48. – Dale Carnegie Training
49. – Small Engine Class
50. – I am going to take all classes related to computers
51. – Learn to operate a computer at the LRC
52. – Learn advanced computer operational skills
53. – Beginning computers
54. – Enrolled in a Word computer class at LRC
55. – Required four hours of computers for a degree
56. – Computer class
57. – Taking computer classes
58. – Self-paced workshop
59. – Learn to operate a computer
60. – Auto Body Repair at Votech
61. – I start orientation at St. John's Hospital—if this applies
62. – Working at classes offered in the LRC
63. – I'm going to get at least an associate degree
64. – Computer classes
65. – I've been attending votech continuously for welding courses
66. - Computer classes

2 Responses – Left Blank

(b) No
247

No. of responses "marked Not Applicable"—because respondent was currently enrolled in a course. 1

The following responses accompanied "no" answers:

One response: No plans, but will attend seminar, though, to learn new skills to improve my effectiveness.

One response: Too busy with new grandson and vacation while on TLO.

One response: this is not my interest profession; this is my means to my liked profession. I feel I would be wasting my time plus yours. I garden, sew, knit, embroidery, quilt, cook and can—I want to run a bread and breakfast.

One Response: Plans are to continue the carpentry class when time allows.

One Response: All the classes you offer on-site is computer and wood carving and I'm not interested in either one.

One Response: I would like to learn sewing machine repair—under study is the only way now and the craftsmen do not want to train anyone who doesn't want employment.

One Response: Although I might need to take basic computers for my job.

One Response: Yes and No—yes to Woodcarving—but as for anything else, I tried Windows '95 but lost interest—don't know what I would do with it [relevancy]

One Response: I did enroll – but class canceled; not enough enrolled "to make"

One Response: I bought a computer—I want to learn how to use it, but have made no definite plans yet

One Response: I want to take some computer classes—but have made no plans yet

APPENDIX L

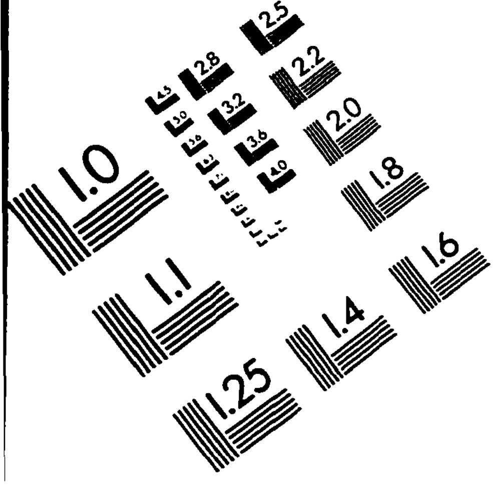
Skilled Trades Classifications

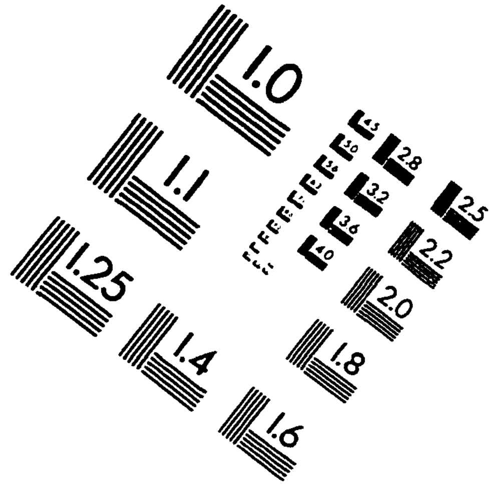
Question No. D4a **1 – No (Skilled Trades)**
No. D4b **2 – Yes (Skilled Trades)**
Trades Coded:

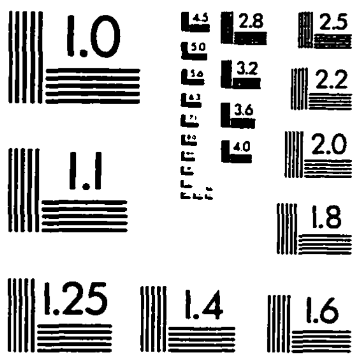
1 – Machine Repairman
2 – Carpenter
3 – Plumber/Pipefitter
4 – Electrician
5 – Millwright
6 – Welder
7 – High Tech
8 – Truck Repair/Mechanic
9 – Painter
10 – Brickmason

Question No. D5a – Years in classification
D5b – Current Classification
Classifications Coded:
1 – Glass-handler tech.
2 – Bracket cutter
3 – Inspector
4 – Gas Hearth Operator
5 – Skilled Trades
6 – Pressform Operator
7 – Battery attendant
8 – Hi-Lo Driver
9 – Cutting line attendant
10 – Glass FAB/Tech
11 – Fork Lift Operator
12 – Solder & checker
13 – Paint Room operator
14 – Verifier
15 – Flexline
16 – Quality Control
17 – Box shop
18 – Hot End
19 – Lehr Operator
20 – Float control Operator
21 - Facility Maintenance/Cleaners
22 – Tin Bath/ISO Coordinator/Customer Service Rep.
23 – Nailer
24 – Furnace Specialist
25 – UAW
26 – Purchasing
27 – Crib Tool Attendant
28 – Crane Operator

IMAGE EVALUATION TEST TARGET (QA-3)







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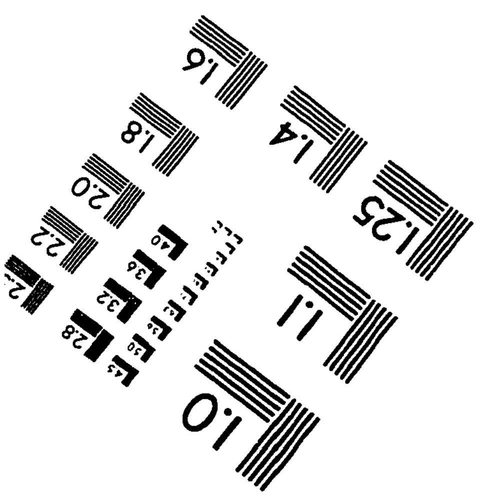

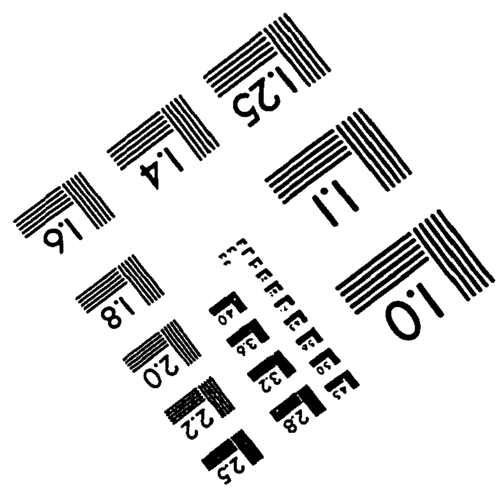

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