2003

Characteristics of Construction Safety Trainers, the Challenges They Experience, How They Meet These Challenges, and the Relationships Between Selected Characteristics of Safety Trainers and Accident Rates Experienced by Their Trainees

Herbert Marion Barber Jr.

THE FLORIDA STATE UNIVERSITY

COLLEGE OF EDUCATION

CHARACTERISTICS OF CONSTRUCTION SAFETY TRAINERS, THE CHALLENGES THEY EXPERIENCE, HOW THEY MEET THESE CHALLENGES, AND THE RELATIONSHIPS BETWEEN SELECTED CHARACTERISTICS OF SAFETY TRAINERS AND ACCIDENT RATES EXPERIENCED BY THEIR TRAINEES

BY

HERBERT MARION BARBER, JR.

A Dissertation submitted to the
Department of Educational Leadership & Policy Studies
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

Degree Awarded
Fall Semester, 2003

The members of the committee approve the dissertation of Herbert Marion Barber, Jr., defended on June 10, 2003.

_____

William R. Snyder
Professor Directing Dissertation

_____

Bonnie Greenwood
Outside Committee Member

_____

Beverly Bower
Committee Member

_____

Michael Biance
Committee Member

Approved:

_____

Carolyn D. Herrington
Chair
Department of Educational Leadership & Policy Studies

The Office of Graduate Studies has verified and approved the above named committee members.

I would like to dedicate this document to my wife, Nancy, and two children, Brandon and Natalie. Nancy has managed to hold our household together as I pursued the doctoral degree and a demanding consulting practice that took me away from home on a weekly basis. At the same time, she has successfully managed her career as an elementary school teacher. Additionally, she has continued her educational endeavors and will complete the requirements for an Ed.S. degree in another semester.

Our children have given throughout this process as well. There have been numerous ball games and family events that have been sacrificed so Daddy could work on this degree. Perhaps our son, 3 years old at the time, summed up this pursuit best when he said one night as I laid him in bed, "Daddy, when you get finished being a doctor, will you be a daddy?"

For the challenges this degree pursuit has brought to Nancy, Brandon, and Natalie, I cannot help but humbly borrow from the words of our Maker: "It is finished."

ACKNOWLEDGEMENTS

I would like to thank my committee, Dr. William Snyder, Dr. Beverly Bower, Dr. Michael Biance, and Dr. Bonnie Greenwood, for guiding me through this process. The pursuit of the doctoral degree is difficult, at best, and my committee has helped to make it as seamless as possible. In particular, I am grateful to Dr. William Snyder for his continued support and guidance as he reviewed revision after revision of this document.

I also would like to acknowledge the numerous friends I made as a student at Florida State University. This pursuit would have been even more difficult without the calming affect of simply knowing that I was not alone during this process. For these friends, I am grateful.

TABLE OF CONTENTS

LIST OF TABLES

ABSTRACT

This study was an examination of the safety trainers who work in large construction firms in the United States. It was conducted in the hopes of helping vocational educators improve construction safety training. The purpose of the study was to determine the 1) specific individual demographic characteristics of safety trainers, 2) challenges they experience when planning, delivering, and evaluating safety training programs, 3) relationships between selected individual demographic characteristics of safety trainers and the accident rates of their trainees, and 4) how safety trainers meet the challenges they experience.

Most trainers in this study were white males with more than 20 years of construction experience. Approximately 57 percent of the safety trainers had earned a bachelor's degree or higher. Only five safety trainers had degrees in education.

Safety trainers believed that they received more support from corporate management than they received from general management, such as project managers, engineers, and superintendents. This belief was found to be significant at the .01 level using a t-test.

Additionally, safety trainers believed that they were better at planning and delivering safety training than they were at evaluating safety training. This belief also was found to be significant ($p<.05$) using a t-test.

Six null hypotheses were developed to investigate the relationships between selected individual demographic characteristics of safety trainers and the accident rates of trainees. Among the findings for these hypotheses, the following was determined:

1. As company size increased, the accident rates of trainees decreased (r=-.328, p=.012).

2. As the educational levels of safety trainers increased, the accident rates of trainees decreased (r=-.440, p=.001).

3. There was no statistically significant relationship between the yearly amount of safety training that safety trainers received and the accident rates of their trainees (r=-.030, p=.826).

4. There was no statistically significant relationship between the number of years of construction experience that safety trainers have and the accident rates of their trainees (r=.054, p=.690).

5. There was no statistically significant relationship between the number of years of safety experience that safety trainers have and the accident rates of their trainees (r=.122, p=.363).

6. There was no statistically significant relationship between the number of years safety trainers have delivered safety training and the accident rates of their trainees (r=.146, p=.274).

Safety trainers met the challenges of not receiving as much support from project managers, engineers, and superintendents as they received from corporate managers by

making deliberate efforts to solicit buy-in from these individuals. Additionally, safety trainers met the challenges of not believing they were as good at evaluating safety training as they believed they were at planning and delivering safety training by receiving additional training in the area of evaluation.

The study also discussed the conclusions and recommendations of the study. The study ended with a call for vocational educators to become more involved in the training of construction safety trainers.

CHAPTER ONE
INTRODUCTION TO THE STUDY

Background of the Study

Safety on the construction site has been a concern of the construction industry for the past few decades. In 1970 the Occupational Safety and Health Act (OSHA) authorized the U.S. Department of Labor to ensure that individuals working in the U.S. construction industry had safe places in which to work (Hinze & Russell, 1995). Despite the implementation of this act over 30 years ago, however, the construction site remains a very hazardous environment (Smith & Roth, 1991).

The construction industry employs over 4 million employees (Austin, Kessler, Riccobon & Bailey, 1996), and approximately one out of every six of these employees can expect to be injured during their construction careers (OSHA, 1997b). According to the Bureau of Labor Statistics (BLS), the number of construction deaths has increased steadily every year since 1993, with the exceptions of years 1996 and 2000 (BLS, 2000; BLS, 1999b; BLS, 1998a; BLS, 1997a; BLS, 1996b; BLS, 1995; BLS, 1994; and BLS, 1993). See Table 1 below for these increases:

TABLE 1

Construction Industry Deaths: Years 1993-2000

Year	Deaths
1993	924
1994	927
1995	1,048
1996	1,039
1997	1,107
1998	1,171
1999	1,190
2000	1,154

The traditional method of improving safety performance and decreasing accidents has been to implement effective safety training programs (Hinze & Harrison, 1981). Effective safety training programs, however, must stem from a well-developed safety plan (Hinze, 1978) and be planned, delivered, and evaluated by qualified safety trainers.

Purpose of the Study

Safety on the construction site involves a number of issues but perhaps none more important than having a well-trained workforce. Further, the construction literature suggests that having a well-trained workforce is a necessary component in reducing accidents in the U.S. construction industry (see Hinze & Harrison, 1981; Hinze, 1978; Austin & Riccobono, 1996; and Bernold & Guler, 1993). To ultimately reduce accidents, OSHA has developed generic guidelines that can be used when planning, delivering, and

evaluating safety training programs (see OSHA 1996a and OSHA 1996b), guidelines that are linked directly to the safety trainer. However, studies in the construction literature primarily have investigated the types and frequencies of construction accidents that occur in the workplace (For a detailed explanation of the types of construction accidents, see Appendix D).

The vocational education literature presents studies that address some of the demographic characteristics of trainers who work in industry, in general, and it presents studies that address some of the challenges that trainers experience. Further, these studies note areas in which trainers must be well-versed to fulfill their roles in industry. However, the studies in the construction literature and the vocational literature have not investigated the trainer directly. Moreover, these studies have not investigated the role that trainers play as it relates directly to safety. For example, the research noted in the literature has not attempted to link the safety trainer directly to construction accidents. This study attempted to address this link and used four basic research questions, including:

1. What are the specific individual demographic characteristics of safety trainers working in large U.S. construction firms?

2. What are the challenges safety trainers working in large U.S. construction firms experience when a) planning safety training programs, b) delivering safety training programs, and c) evaluating safety training programs?

3. What are the relationships between selected specific individual demographic characteristics of safety trainers and the accident rates their trainees experience?

4. How do safety trainers working in large U.S. construction firms meet the challenges they experience when planning, delivering, and evaluating safety training programs?

Significance of the Study

The need to continuously improve employee safety in the U.S. construction industry is undeniable. Losses due to accidents in the U.S. construction industry total $8.9 billion annually (Kartman, 1997), with some estimates approaching $10 billion annually (Clough, 1986). With an average of one death and 167 injuries per $100 million of construction spending, the construction industry is a hazardous industry in which to be employed (Smith & Roth, 1993).

Ninety-eight percent of all construction accidents are a result of unsafe employee behavior (Blackmon & Gramopadhye, 1995), but exactly how these accidents can be prevented, is unclear. However, Smith and Roth (1991) argue that most construction accidents can be prevented.

The traditional method of improving safety performance in the U.S. construction industry has been to implement effective safety training programs (Hinze & Harrison, 1981). However, many studies involving construction safety concentrate on the types of accidents and the prevention of accidents (see Kartman, 1997; Hinze & Harrison, 1981; Hinze & Pannullo 1978; and Smith & Roth, 1991), not on issues

associated with safety training and the individual safety trainer and his work. These studies do not concentrate on the specific individual demographic characteristics of safety trainers and the challenges that safety trainers experience when planning, delivering, and evaluating safety training programs. Also, these studies do not reveal the relationships between these selected specific individual demographic characteristics of safety trainers and the accident rates their trainees experience, nor how safety trainers meet the training challenges associated with their jobs.

This study was an attempt to address these gaps in the research as currently reported in the literature. The findings of this study are intended to serve as a baseline for augmenting existing methodologies already used in preventing construction-related accidents. The results also should provide guidance to vocational educators who prepare construction safety professionals.

Definitions of Terms

The following terms were used in this study and were defined, for the purposes of this study, as follows:

1. large construction firm - a private organization that is listed in the Directory of Contractors as one of the top 200 construction companies in the United States, based upon gross revenues.

2. top 200 contractors - the 200 largest private organizations, based on gross revenues, that offer building construction or construction management services in the U.S. construction industry.

3. Safety training – that knowledge that relates to developing learning activities, delivering knowledge and skill, and evaluating knowledge transfer (OSHA, 1996b) for the specific purpose of reducing or preventing the likelihood of work-related bodily injury or death.

4. Safety trainer – an individual employed in the construction industry who plans, delivers, and evaluates declarative or procedural knowledge and skill to employees as a means of reducing or preventing the likelihood of work-related bodily injury or death.

5. Specific individual demographic characteristics – the distinct individualities of safety trainers participating in this study, such as gender, race, and the educational level of safety trainers.

6. vocational educator – an individual who trains or educates individuals in a college, university, or work-related environment in areas such as industrial education, industrial technology, building construction, construction safety, industrial safety, or human resource development.

7. confined space – any enclosed area with limited means of egress that increases the probability of an employee being injured or dying.

8. willful safety violation – acts committed by employees with an intentional disregard of, or indifference to, OSHA regulations (OSHA, 1996a).

9. accidents – unpredicted or uncontrolled events (Laufer & Ledbetter, 1986) on a construction site that increase the likelihood that work-related bodily injury or death will occur.

10. personal protective equipment – an item or article worn on the human body that may serve to decrease

the likelihood that work-related bodily injury or death will occur, such as ear plugs, hardhats, safety glasses, respirators, face shields, safety harnesses, and steel-toed boots.

Delimitations of the Study

The scope and parameters of this study were limited in several ways. First, data were collected only during 2003 from safety trainers working in the top 200 construction companies operating in the United States. Data collected in later years almost certainly will change due to changes within the field of construction safety training. For example, over the past 15 years fall protection harnesses have improved to better protect workers when falls occur, thus, helping to reduce the number of deaths occurring from falls. While improvements such as these are welcomed, they will affect future studies of this nature.

Also, the trainers in this study are limited to employees of construction companies that generate their gross revenues from construction projects associated with the following construction sectors, as defined in the Directory of Contractors: a) general building, b) manufacturing, c) power, d) water & waste water, e) industrial/petrochemical, and f) hazardous waste.

Limitations of the Study

This study was an exploratory examination of safety trainers working in the U.S. construction industry. By design, the study collected and analyzed data from safety

trainers in the U.S. construction industry. Accordingly, the findings of this study should be limited in their application for use by vocational educators, safety professionals, or other individuals involved in construction safety training for several reasons. For example, construction employees are subjected to constant pressures to perform their duties as quickly as possible as penalty clauses and incentive clauses are often written into contractual agreements between the project owner and the construction company that require the construction company to complete the project under an established schedule and budget. While the construction company may receive a monetary incentive for completing the project on schedule and within budget, monetary penalties for completing the project late and over budget usually are severe. These pressures certainly would be different than with other industries, and thus, the findings of this study should be limited in their application as noted.

Assumptions of the Study

Assumptions were made during the course of this research that affected the study. First, and perhaps foremost, it was assumed that the construction companies selected to participate in this study consider the safety of their employees important and that they have safety training programs. Further, it was assumed that the safety trainers representing each of the construction companies were able to respond to each survey instrument item correctly and honestly.

Should these assumptions not hold true, the study could have been adversely affected. Perhaps the most negative ramification that would have occurred would result from a construction company agreeing to participate in the study but their safety trainer not responding correctly and honestly to questions asked for fear of personal negative ramifications. For example, a safety trainer may choose to state that his trainees have not been involved in accidents for fear that doing so would reflect upon himself negatively.

Procedures of the Study

The decision to investigate safety trainers in the U.S. construction industry was based on the researcher's experience in the construction industry. The researcher's background includes several years of experience working on large construction projects in the United States for some of the same construction companies that have participated in this study. Over the course of his experience, he has seen numerous construction employees become involved in accidents. Further, he regularly serves as an expert witness on civil cases that involve construction accidents. Thus, his interest in improving construction safety comes naturally.

After the decision to investigate safety trainers was made, an informal review of the current literature was conducted. The purpose of the study was established, followed by the development of the research questions and supporting rationale that would guide the study. Next, a thorough review was conducted of the construction

literature, vocational education literature, and other supporting literature, as the literature related to safety and training.

It was decided that the study would be descriptive and employ a survey process with a follow-up telephone interview. A survey instrument specification was selected to guide the researcher in developing the survey instrument. Following the survey instrument development and approval, it was mailed to the top 200 construction companies in the United States. Data relevant to each research question were collected and analyzed using measures of central tendency, such as frequency distributions, percentages, and standard deviations, and bivariate correlations also were calculated.

Follow-up telephone interviews were conducted from a sample of participating safety trainers to determine their perceptions of how they respond to the challenges they experience when planning, delivering, and evaluating safety training programs. The data collected during the follow-up telephone interview were sorted into common themes and synthesized into narrative summaries, as recommended by McMilliam and Shumaker (1997) and Leedy (1992), with the summaries describing how safety trainers meet the challenges they experience. The findings, conclusions, and recommendations of the study then were addressed.

Summary

This study was an exploratory examination of the trainers who deliver safety training programs for construction companies operating in the U.S. construction

industry. The purpose of the study was to determine specific individual characteristics of safety trainers, the challenges safety trainers experience when planning, delivering, and evaluating safety training programs, the relationships between selected specific individual demographic characteristics of safety trainers and the accident rates their trainees experience, and how these challenges are met by safety trainers.

CHAPTER TWO
REVIEW OF LITERATURE

Introduction

There are many private organizations and governmental agencies interested in employee safety in the U.S. construction industry, but the primary party responsible for employee safety on the construction site is the individual construction company (Smith & Roth, 1991). Each construction company is responsible not only ethically (Austin & Riccobono, 1996) to provide safe working environments for its employees but also legally (Hinze, 1978). However, construction sites in the United States remain some of the most dangerous places in which to work (Kartman, 1997).

Safety is often discussed in construction management meetings as a priority, but in reality, it often takes a low priority in issues associated with scheduling and budgeting decisions (Smith & Roth, 1991). Safety is rarely adequately managed and is often even blatantly neglected on many construction sites (Smith & Roth, 1991). When it comes to spending money on safety, many construction managers feel that safety is not vital to the success of the construction project. Construction managers seem to fail to realize that an effective safety program can reduce construction site accidents and reduce costs (Hinze & Rabound, 1988).

Safety on the construction site can be achieved only through purposeful safety prevention planning (Hinze, 1978). The traditional method of improving safety on the construction site, as part of a safety prevention planning program, has been to implement an effective safety training program (Hinze & Harrison, 1981). These effective safety training programs must be planned, delivered, and evaluated by qualified safety trainers. This study was an attempt to investigate these safety trainers.

This chapter presents the current literature associated with construction safety training as it relates to those individuals who plan, deliver, and evaluate safety training programs. The chapter presents a discussion focused around the research questions of the study and includes an initial section on accidents in the U.S. construction industry. Sections on the demographic characteristics of trainers and the challenges that trainers experience while working in industry are then presented. The chapter concludes with a summary that discusses the relationships between the current literature and the research questions of this study.

Construction Accidents

The construction industry has gone to great measures to prevent accidents. Despite these efforts, accidents continue to occur on a regular and almost predictable basis, although accidents are assumed to be unpredicted and uncontrolled events (Laufer & Ledbetter, 1886). Ninety-eight percent of these unpredicted and uncontrolled events can be attributed to the unsafe behavior of employees,

employees who have probably committed these same unsafe acts many times before finally being injured (Blackmon & Gramopadhye, 1995).

The United States Department of Labor, Bureau of Labor Statistics, reports an average of one death and 167 injuries per $100 million of annual construction spending (Kartam, 1997), while Hinze (1981) noted that, at most, construction companies only spend 0.2 percent to 2 percent of their annual contract revenues on safety. In 1996 one out of every six construction employees could expect to be injured (OSHA, 1997) on a construction site, and from 1995 through 2000, one employee out of every 5,197 employees could expect to die from work-related injuries (see BLS, 2000; BLS, 1999b; BLS, 1998a; BLS, 1997a; BLS, 1996b; & BLS, 1995), as compared to only one death per 25,814 employees working in manufacturing (see BLS, 2000; BLS, 1999b; BLS, 1998a; BLS, 1997a; BLS, 1996b; and BLS, 1995). Six and one half million workdays are lost each year in the construction industry due to injuries alone (Bernold, 1993), with construction accidents resulting in over 200,000 disabling injuries (Hinze & Wiegand, 1992) at an average cost of over $18,000 per injured employee (Kartam, 1997).

When comparing deaths in the construction industry to the other eight private industry sectors tracked by OSHA, the construction industry consistently ranks as the industry with the highest number of employee deaths. The table below is a compilation of information distributed by the Bureau of Labor Statistics (see BLS, 2000; BLS, 1999b; BLS, 1998a; BLS, 1997a; BLS, 1996b; and BLS, 1995) and

indicates the number of deaths each industry in the private sector experienced for the years 1995 through 2000.

TABLE 2

Death by Private Industry Sector: Years 1995-2000

Industry	2000	1999	1998	1997	1996	1995
Agriculture	720	807	831	830	798	793
Mining	156	121	146	158	152	156
Construction	1,154	1,190	1,171	1,107	1,039	1,048
Manufacturing	668	719	694	743	715	702
Transportation	957	1,006	909	1,002	947	880
Wholesale	230	237	228	241	267	254
Retail	594	507	569	665	672	675
Real Estate	79	105	92	97	114	124
Services	768	732	757	722	767	737

As a percentage of the total number of industry deaths for the years 1995 through 2000, the construction industry has consistently experienced approximately 20 percent of these deaths. These percentages for each year are a) 2000, 21.7 percent; b) 1999, 21.9 percent; c) 1998, 21.7 percent; d) 1997, 19.9 percent; e) 1996, 19.0 percent; and f) 1995, 19.5 percent (For a more detailed explanation of the specific types of construction accidents noted in the construction literature, see Appendix D).

Costs associated with construction accidents and injuries are staggering, and it appears that the $423 billion construction industry can do little to curb construction site accidents (Austin & Kessler, 1996).

However, OSHA's director, John Henshaw, still believes that the construction industry's ever increasing number of fatalities warrants further investigation (Ichniowski, 2001).

Demographic Characteristics of Safety Trainers

A review of the literature from 1970 through the present suggests that effective safety training programs are necessary components in reducing work-related accidents. However, research on construction safety trainers, per se, is limited. In fact, no studies were found in the construction literature, vocational education literature, or other supporting literature that addressed issues associated with construction safety trainers directly. Likewise, no studies were revealed in the literature that investigated the demographic characteristics of safety trainers. Research on training in the workplace typically focuses on the needs of the organization (Sleezer, 1992) and the learner (Knowles, 1984), not on the actual trainer (Swanson & Falkman, 1997).

However, in 1987 McCullough noted that trainers working in industry, in general, were well educated. Eighty nine percent of the trainers he investigated had at least a bachelor's degree. Of those trainers having at least a bachelor's degree, 41 percent had a master's degree and 13 percent had a doctorate. Approximately 18 percent of the trainers in his study had bachelor's degrees in education, and sixteen percent of the trainers had bachelor's degrees in business. Most of the other trainers had bachelor's degrees in social science (15 percent) or

psychology (11 percent). Trainers typically had graduate degrees in education (32 percent), psychology (19 percent), or social sciences (7 percent).

More recently, while Swanson & Falkman (1997) noted that most trainers in industry are not graduates of academic programs designed to prepare them for training positions in industry, Olson's (1994) study of 56 trainers in industry revealed that 63.6 percent of the trainers had graduate degrees in education. Olson further noted that the typical trainer was male (74.2 percent) and was between 36 and 44 years of age (58.1 percent). Over one-half of the trainers worked in engineering or industrial technology and had at least eight years of industrial experience prior to beginning their careers in training.

In that same 1994 study, Olson determined demographic characteristics of instructors working in 2-year vocational colleges. Of the 55 instructors Olson investigated, 66.6 percent were male, and 40 percent were between 36 and 44 years of age. Nearly all instructors were employed full time in training and spent 20 to 24 hours per week training.

Most of the vocational college instructors (73.9 percent) had more than 11 years of experience in training and education, and 94.7 percent had university-level teaching experience. Educationally, 67.4 percent of the instructors had a master's degree, while 14.3 percent of the instructors had only a bachelor's degree. The instructors who had master's degrees had majored in business (40 percent), education (35 percent), or engineering (20 percent). The degree fields of those instructors who had only bachelor's degrees were not noted

in the study, and no instructors were noted by the researchers as having doctoral degrees.

Challenges of Safety Trainers

Many of the generic guidelines that OSHA suggests for improving construction safety performance are linked directly to safety trainers (see OSHA, 1996b). For example, OSHA suggests that trainers 1) determine if training is necessary, 2) identify training needs, 3) identify goals and objectives, 4) develop learning activities, 5) deliver the training, 6) evaluate the training program, and 7) improve future training.

As these guidelines relate to planning, delivery, and evaluation of safety training programs, OSHA (1996) suggests that trainers 1) provide a clear overview of the material to be covered, 2) relate the material covered to the employee's interest, and 3) reinforce the learning by summarizing the material that was covered. OSHA suggests that the following five basic principles be used when planning, delivering, and evaluating safety training programs:

1. Employees should understand the purpose of the training and why it will be useful.
2. The training should be organized so as to match the steps the trained employees will take on the job.
3. Employees should be able to immediately practice and apply new knowledge and skills.
4. Inform employees when they are practicing safety habits correctly or incorrectly.

5. Training should incorporate a variety of training materials, such as written instruction, audiovisual instruction, and lectures.

Students in traditional teacher education programs of vocational education receive training on topics such as educational methods, adult learning, and instructional design (Leach & Sandall, 1995). It could be assumed that trainers who have received such training and education would have little difficulty using the safety training program guidelines suggested by OSHA. However, many graduates of traditional education programs in vocational education find that their non-technical educations have not prepared them for work in industry (Roth, 1981). Over one-half of the trainers studied by Weischadle (1984) stated that the major weakness trainers had in fulfilling their roles as trainers was their lack of business and technical skills.

Trainers in industry must not only be proficient in performing the typical duties associated with training, they must be subject matter experts who can communicate their skills and knowledge to others (Dahlgren & Stone, 1990). For instance, safety trainers working in the construction industry must feel comfortable planning, delivering, and evaluating safety training programs in a variety of subject areas associated with safety, such as those involving falls, trenching, heavy equipment, and confined space entry (see Personick, 1996; Cohen & Lin, 1991; Hinze, 1994; Hinze & Russell, 1995; Richardson & Reyes, 1998; Manwaring & Conroy, 1990; and for a more detailed discussion regarding the types of construction accidents that safety trainers must understand, see

Appendix D). Trainers who lack subject matter expert skills, such as in these areas, are at a distinct disadvantage (Leach & Sandall, 1995).

While it is difficult to determine from the literature common training problems (Swanson, 1996), Swanson and Falkman (1997) investigated 371 trainers in industry in an attempt to determine the challenges trainers experience in their roles as trainers. The twelve most common challenges experienced by trainers were associated with 1) fear, 2) credibility, 3) personal experiences, 4) difficult learners, 5) student participation, 6) timing, 7) instructional content adjustment, 8) questioning, 9) feedback, 10) media, materials, and facilities, 11) opening and closing comments, and 12) dependency on notes.

Leach (1999) sought to determine what he called "exemplary" characteristics of trainers working in industry. His research included 27 trainers and was conducted on-site using an interview process. Trainers were asked to describe incidents centering around times when they felt particular training sessions had been very good and when they felt particular training sessions could have been improved, given hindsight.

Leach grouped his data into general themes, including 1) preparation skills, 2) presentation skills, and 3) group process skills. He found that "exemplary" trainers 1) were responsive, 2) showed enthusiasm of the training material by thoroughly mastering the material prior to training delivery, 3) used humor and made training sessions fun, 4) were sincere and honest with their students, 5) were flexible during training delivery, adjusting training content during delivery to meet the needs of learners, and

6) were tolerate of critical comments made by their students, choosing to view critical comments as possible areas that may need improving rather than as personal attacks.

In another study, Leach and Sandall (1995) attempted to determine the business skills necessary for training professionals. They surveyed 800 trainers who worked in industry and concluded that trainers must be able to perform the following:

1. select, prepare, and organize a presentation,
2. write business correspondence in an appropriate style,
3. use a computer for business applications,
4. understand basic employee behavior in the work setting,
5. make speeches and give presentations,
6. understand the principles of group process,
7. understand the principles of organizational behavior, and
8. implement and manage change.

Kaeter (1995) also noted subject areas that he judged to be necessary for preparing individuals for careers in training. These areas included 1) administrative and educational leadership, 2) adult education, 3) career development, 4) human resource development, 5) human resource management, 6) industrial psychology, 7) instructional design and development, 8) instructional technology, 9) organization communications, 10) organization development, and 11) vocational/technical education.

Along with those studies in the literature that noted some of the challenges that trainers in industry experience and those studies in the literature that noted areas in which trainers must be knowledgeable, Dare and Leach (1997) conducted a study to determine the extent to which vocational education programs in higher education successfully prepare vocational educators for training positions in industry. The study consisted of 430 faculty members in university vocational education programs and determined that of the 23 areas that vocational educators perceived as important when preparing trainers for positions in industry, 19 areas were perceived as not adequately covered in coursework. These 19 areas involved 1) adult learning understanding, 2) career development theories, 3) competency identification skills, 4) computer competencies, 5) electronic-systems skills, 6) evaluation skills, 7) media selection skills, 8) training and development theories and techniques, 9) research skills, 10) organization behavior understanding, 11) organization development theories and techniques, 12) coaching skills, 13) group-process skills, 14) questioning skills, 15) feedback skills, 16) negotiation skills, 17) relationship building skills, 18) data reduction skills, and 19) visioning skills.

Summary

Safe working conditions on U.S. construction sites can only be achieved through appropriate safety planning (Hinze, 1978). As part of the safety planning process, the traditional method of improving safety in the U.S.

construction industry has been to implement effective safety training programs (Hinze, 1981). This study investigated areas associated with these safety training programs.

This chapter presented a review of the current literature regarding construction safety training. The review of literature initially presented a general overview of construction accidents, primarily noting the frequencies of accidents over the past several years. The chapter also presented the literature regarding the demographic characteristics of safety trainers and the literature regarding the challenges safety trainers experience when planning, delivering, and evaluating safety training programs.

No studies were found in the construction literature in whole or part that addressed the demographic characteristics of construction safety trainers directly, although a few studies were found in the vocational education literature that addressed the demographic characteristics of trainers working in industry in general. For instance, McCullough (1987) and Olson (1994) determined that most trainers in industry were well educated, with most trainers having at least a bachelor's degree. Further, Olson noted that over half of the trainers had acquired at least eight years of experience in engineering or industrial technology prior to beginning their careers as trainers.

These prior occupational experiences in industry may have some bearing on their roles as trainers. In the construction industry, there may be relationships that exist between the occupational experiences of safety

trainers and the accident rates experienced by safety trainees. For instance, there may be a relationship between the number of years of training experience a safety trainer has acquired and the accident rates that safety trainees experience. There also may be other relationships between some of the demographic characteristics of safety trainers and the accident rates experienced by trainees. For example, the educational level of safety trainers may be related to the accident rates experienced by safety trainees.

Paralleling the literature regarding the demographic characteristics of safety trainers, no studies were found in the construction literature that addressed the challenges that safety trainers experience or how they meet these challenges. However, OSHA (1996b) suggests that safety trainers should be able to identify training needs, develop and deliver training, and evaluate and improve training.

The vocational education literature addressed some of the challenges that trainers in industry experience, although these challenges are not well defined (see Leach, 1999). For example, Swanson and Falkman (1997) determined the twelve most common challenges that trainers must be prepared to meet. These challenges involved 1) fear, 2) credibility, 3) personal experiences, 4) difficult learners, 5) student participation, 6) timing, 7) instructional content adjustment, 8) questioning, 9) feedback, 10) media, materials, and facilities, 11) opening and closing comments, and 12) dependency on notes.

Leach and Sandall (1995) noted that the primary task that trainers must be able to perform was the obvious:

Trainers must be able to select, prepare, and organize a presentation. When preparing these presentations, trainers must understand the fundamentals of adult education and instructional design and development (Kaeter, 1995). Among other tasks noted in the vocational education literature, trainers must be able to perform tasks such as identify employee training needs and evaluate training for the purposes of improving future training (see Dare & Leach, 1997). Trainers without these abilities, including those working in the construction industry, are at a disadvantage (Leach & Sandall, 1995).

The review of the construction literature, vocational literature, and other supporting literature demonstrated the need for a study that directly investigates trainers involved in construction safety. The literature not only helped substantiate the necessity of this study, it served as a guide to help the researcher develop the specific purposes of the study and investigate those purposes as they related to issues involving the demographic characteristics of safety trainers and the challenges they experience.

CHAPTER THREE
METHODOLOGY OF THE STUDY

Introduction

This study was an exploratory examination of the safety trainers who work for large construction companies operating in the U.S. construction industry. This chapter describes the methods that were used to examine these safety trainers.

This chapter initially presents a section regarding the design of the study. A discussion is presented next that details how the survey instrument was developed, how it was validated, how it was administered, and how the data were analyzed. Next, sections are provided that describe how the follow-up telephone interviews were developed, how they were administered, and how the data were analyzed. The chapter is concluded with a summary.

Design of the Study

The research questions for this study were developed to guide the researcher as he examined the safety trainers in this study. The research questions allowed the specific individual demographic characteristics of these safety trainers, the challenges they experience, the relationships between selected individual specific demographic characteristics of safety trainers and the accident rates

experienced by their trainees, and how safety trainers meet the challenges they experience to be determined.

The research questions and accommodating null hypotheses for this study were:

1. What are the specific individual demographic characteristics of safety trainers working in large U.S. construction firms?

2. What are the challenges that safety trainers experience when a) planning, b) delivering, and c) evaluating safety training programs in large U.S. construction firms?

3. What are the relationships between selected specific individual demographic characteristics of safety trainers and the accident rates their trainees experience?

a. There is no relationship between company size and the accident rates trainees experience.

b. There is no relationship between the education level safety trainers have and the accident rates their trainees experience.

c. There is no relationship between the number of hours of safety training safety trainers have received over the last 12 months and the accident rates their trainees experience.

d. There is no relationship between the number of years of experience safety trainers have worked in the construction industry and the accident rates their trainees experience.

e. There is no relationship between the number of years safety trainers have worked in construction safety and the accident rates their trainees experience.

f. There is no relationship between the number of years safety trainers have delivered safety training and the accident rates their trainees experience.

4. How do safety trainers working in large U.S. construction firms meet the challenges they experience when planning, delivering, and evaluating safety training programs?

This study incorporated as a method of inquiry primarily quantitative research methods, with these methods being complemented by follow-up telephone interviews. The specific individual demographic characteristics of safety trainers, the challenges they experience when planning, delivering, and evaluating construction safety training programs, and relationships between selected specific individual demographic characteristics of safety trainers and the accident rates their trainees experience incorporated a quantitative method of inquiry while the follow-up telephone interview process was used to determine how safety trainers meet the challenges they experience.

The specific individual demographic characteristics of safety trainers were investigated through the development and use of a survey instrument. The challenges that safety trainers experience when planning, delivering, and evaluating safety training programs were determined through the same survey instrument. These challenges included issues such as the perceived support safety trainers received from management and safety trainers' perceptions of their abilities to perform their roles as planners, deliverers, and evaluators of safety training programs.

The relationships between selected specific individual demographic characteristics of safety trainers and the

accident rates their trainees experience also were investigated. These relationships were investigated using the data collected through the survey instrument.

Survey research, and particularly the development and use of a survey instrument, was the most efficient method for collecting data from the participants in this study. Gay (1996) suggested that there are at least three additional reasons why survey research is preferred over other methods of collecting data. These reasons included the fact that survey research:

1. requires less time than other research techniques,
2. is less expensive than other research techniques, and
3. allows data to be collected readily from large samples or populations.

Finally, this study included follow-up telephone interviews to determine how safety trainers met the challenges they experience when planning, delivering, and evaluating safety training programs. The interviews were conducted using specific follow-up interview questions that were developed after the initial survey data for the specific individual demographic characteristics of the safety trainers and the challenges they experience were collected and analyzed. All safety trainers participating in the interview were asked the same questions, and then, their responses were recorded, analyzed, and summarized.

Population of the Study

The human resources managers at the top 200 largest construction companies in the United States were asked to participate in this study. They were asked by the researcher to have their companies participate in the study by requesting one of their safety trainers represent the company in the study. The decision as to which safety trainer was selected to represent each construction company was left to the discretion of each human resources manager.

Fifty eight safety trainers, representing 58 different construction companies, responded positively to the request to participate in this study. This represented a response rate of 29 percent of the companies in the study. The response rate was considered acceptable per estimates offered by Light, Singer, and Willet (1990) and Gay (1996). Light, Singer, and Willet estimated that a sample size of 37 allows for large effects to be detected in studies involving correlation. Gay noted that 30 participants are generally considered acceptable for studies involving correlation.

Of the 58 construction companies represented in the study, 12.1 percent of the companies had annual gross revenues of less than $250 million, 46.6 percent of the companies had annual gross revenues between $250 million and $500 million, 24.1 percent of the companies had gross annual revenues between $500 million and $999 million, and 17.2 percent of the companies had gross annual revenues of over one billion dollars. While all 58 construction companies had a safety trainer complete the survey instrument in this study, nine of these 58 safety trainers

were selected to participate in the follow-up telephone interview.

The nine safety trainers were selected based upon the distribution of the annual gross revenues, i.e. company size, of the 58 companies that responded positively to the survey instrument. One safety trainer participated in the follow-up telephone interview for approximately every 10 percent who participated in the survey in each company size category. See the table below for these distributions.

TABLE 3

Distribution of Participants

Company Size	Percentage Completing Survey Instrument	Number Completing Telephone Interview
Less than $250M	12.1	1
$250-$500M	46.6	4
$500-$999M	24.1	2
Over $1B	17.2	2
Total	58	9

Development of the Survey Instrument

A survey instrument was developed and used to investigate a) the specific individual demographic characteristics of safety trainers in large U.S. construction firms, b) the challenges they experience when planning, delivering, and evaluating safety training programs, and c) the relationships between selected specific individual demographic characteristics of safety

trainers and the accident rates trainees experience. The survey instrument was divided into two basic sections. The first section included items associated with the specific individual demographic characteristics of safety trainers, and the second section included items associated with the challenges safety trainers experience when planning, delivering, and evaluating safety training programs. All instrument items were close-ended.

To develop the survey instrument, Huck (2000) recommends that researchers consider investigating three basic types of validity. The three basic types of validity are a) criterion-related validity, b) content-related validity, and c) construct-related validity.

Criterion-related validity allows one to compare two measurement tools, with one measurement tool being statistically compared to another measurement tool (Leedy, 1992), or to statistically predict the future performance, or score, of an individual (Gay, 1996). For the purposes of this study, evidence of criterion-related validity was not offered since it was not the intent of this study to compare the data from the survey instrument developed for this study with data from another survey instrument. Also, it was not the intent of this study to predict the scores of individual safety trainers not participating in this study.

Evidence that content-related validity existed was offered in this study, however. Content-related validity often is equated with face validity and asks the researcher to subjectively answer two basic questions:

1. Is the instrument measuring what it is supposed to measure?

2. Is the sample being measured adequate to be representative of the behavior or trait being measured (Leedy, 1992, p. 41)?

"There is no formula by which [content-related validity] can be computed, and there is no way to express it quantitatively (Gay, 1996, p. 140)." Rather, content experts typically are used to subjectively judge whether the items on a specific instrument are representative of the intended constructs, or areas, to be measured (Gay, 1996).

The third basic type of validity is construct-related validity. Construct-related validity is the degree to which an instrument measures a specific construct or group of constructs (Gay, 1996). Of the three basic types of validity, it is the most difficult to obtain (McMillan & Schumaker, 1997). "The process of validating a test of a construct is by no means an easy task (Gay, 1996, p. 141)." "Generally, a number of independent studies are required to establish the credibility of a test of a construct (Gay, 1996, p. 141)."

Not only did time and financial constraints not allow for several independent studies to be conducted to validate construct-related validity for the survey instrument used in this study, Gay (1996) and McMillan and Schumaker (1997) suggest that validating construct-related validity is more necessary in tests that measure performance-related constructs rather than instruments, such as questionnaires, that are exploratory by design. It is more important to gather evidence that validity exists and simply report the evidence that was gathered (McMillan & Schumaker, 1997). For the purposes of this study, the content areas being

investigated, i.e., specific individual demographic characteristics of safety trainers and the challenges safety trainers experience, evidence of construct-related validity was offered within the study, as is suggested by McMillan and Schumaker (1997).

To offer additional evidence of validity for this study, a reliability coefficient was calculated to investigate the internal consistency of the survey instrument that was developed and used in this study. Cronbach's alpha was used for this investigation since it allows instruments to be scored with three or more possible values, e.g. Likert-type scales (Huck, 2000) and since it generally is considered to be "the most appropriate type of reliability for survey research" (McMillian & Schumaker, 1997, p.242). The Cronbach's alpha coefficient for the survey instrument used in this study was calculated to be .749, which is much higher than the .50 value for reliability that McMillian & Schumaker and other researchers (see Huck, 2000; Glass & Hopkins, 1997; and Gay, 1996) suggest for exploratory research in relatively new domains. Thus, the items contained within the survey instrument were considered to be internally consistent.

To develop the survey instrument a model developed by Dr. Albert Oosterhof at Florida State University was used. The model requires one to develop a specification to guide the development of the survey instrument. The specification, shown in Appendix B, included an overview of the survey instrument that generally described the study and its purpose. The approximate time necessary for participants to complete the survey instrument was also noted, along with an overview describing how the survey

instrument would be administered. Next, the content areas and research questions were noted, and objectives for each research question were presented. Finally, the instrument items for each research question were stated. Refer to the tables 4, 5, 6, and 7 to review these, and refer to Appendix B to review the survey instrument specification and Appendix A to review the survey instrument itself.

TABLE 4

Survey Instrument Items: Research Question 1

Research Question	Items
What are the specific individual demographic characteristics of safety trainers working in large U.S. construction firms?	1. What is your company's annual gross revenue? 2. What is your gender? 3. What is your race? 4. What is your approximate annual income? 5. What is the highest formal education you have completed? 6. State the area (major) that describes each degree. 7. How long have you worked in the construction? 8. How long have you worked in construction safety? 9. How long have you actually delivered safety training? 10. Do you work full-time as a safety trainer? 11. About how many clock hours of safety training did you receive over the last year?

TABLE 5

Survey Instrument Items: Research Question 2

Research Question
What are the challenges safety trainers working in large U.S. construction firms experience when a) planning, b) delivering, and c) evaluating safety training programs?
Items
1. Do you have adequate time to prepare training programs?
2. Have you ever received formal training on how to conduct training needs assessments?
3. How often do you conduct training needs assessments prior to developing new training programs?
4. Do you feel that your training needs assessments measure training needs or training wants?
5. How often do trainees provide input into the selections of training topics?
6. Does the training you provide reduce the number of accidents?
7. How well does corporate management support safety training?
8. How well does general management support safety training?
9. Does your company provide adequate financial support for safety training?

TABLE 5 cont.

Items
10. In general, how good would you say that you are at planning safety training?
11. How seriously do your trainees take safety training?
12. How seriously do project managers take safety training?
13. About how early do you arrive to the training site?
14. How confident do you feel when delivering safety training?
15. How often do you feel nervous when delivering safety training?
16. How often do you feel that you do not have the appropriate credentials?
17. How often do you feel like you are an expert in the topic you are delivering?
18. How often do you share your personal experiences during training delivery?
19. About how many of your trainees speak English?
20. How often do you use persons as translators?
21. About how many clock hours per person of safety training did persons in each position noted below receive over the last year?
22. What software packages do you use to deliver training?
23. How motivated are trainees during training?
24. How often do you use humor as a motivational tool?
25. How often do you ask open-ended questions?

TABLE 5 cont.

Items
26. About how many trainees are in each class?
27. How often do you use small group activities?
28. How comfortable do you feel adjusting the content of the training during delivery?
29. How often do you correctly anticipate questions from trainees?
30. How comfortable do you feel telling trainees you do not know the answer to their questions?
31. Overall, how comfortable do you feel using media equipment, such as VCRs, televisions, computers, projectors, and similar equipment?
32. Overall, how comfortable do you feel demonstrating the use of safety equipment, such as harnesses, respirators, and similar equipment?
33. In general, how good would you say you are at delivering safety training?
34. Do you have a means through which you evaluate the safety training you deliver?
35. How often do you ask trainees to complete training evaluations?
36. How often do you incorporate trainees' feedback into training?
37. In general, how good would you say you are at evaluating safety training?

TABLE 6

Survey Instrument Items: Research Question 3

Research Question

What are the relationships between selected specific individual demographic characteristics of safety trainers and the accident rates their trainees experience?

Items

1. Out of 1,000 employees that you have trained on safety-related topics over the last 12 months, regardless of the clock hours each employee received and the specific content of the training, how many employees were involved in a construction-related accident over that same 12 month period?
2. What is your company's annual gross revenue?
3. What is the highest formal education you have completed?
4. About how many clock hours of safety training did you receive over the last year?
5. How long have you worked in the construction?
6. How long have you worked in construction safety?
7. How long have you actually delivered safety training?

TABLE 7

Survey Instrument Items: Research Question 4

Research Question	Items
How do safety trainers working in large U.S. construction firms meet the challenges they experience when planning, delivering, and evaluating safety training programs?	1. How well does corporate management support safety training? 2. How well does general management support safety training? 3. In general, how good would you say that you are at planning safety training? 4. In general, how good would you say you are at delivering safety training? 5. In general, how good would you say you are at evaluating safety training?

Note: The findings from these items were used to develop the questions that were asked in the fourth research question. The decision to use these items was made after the data for the survey instrument were analyzed.

After the survey instrument was developed, it was sent to the content experts for critique. The content experts for this study were Dr. Doug Kruger of East Carolina University and Professor Lynn Fine of Georgia Southern University. Dr. Kruger and Professor Fine each have more

than 30 years of experience in construction safety. Following Leedy's (1992) suggestion, the content experts determined whether the survey instrument items were representative of the content areas in the study and ultimately whether the items measured the noted content areas.

To determine the representativeness of the content areas in the study, the content experts were asked to draw from their 60 years of collective experience in construction. They were asked to determine whether the survey instrument items adequately sampled each content area, as suggested by Gay (1996).

At the completion of the critique of the survey instrument by the content experts, revisions were made. For example, items were added to the survey instrument that allowed safety trainers to state their perceptions of the support they receive from management regarding safety training.

The survey instrument was pre-tested. For pre-testing purposes, Gay (1996) suggests that "having two or three available people complete the questionnaire first will result in the identification of major problems (p. 258)," while Converse and Presser (1986) suggest that pre-testing will reduce ambiguity in the survey instrument items. Following the advice of other researchers (see Patten, 1998; Converse & Presser, 1986; and Gay, 1996), two safety trainers currently working in the U.S. construction industry were asked to complete the survey instrument, noting their questions, comments, or suggestions. The safety trainers who conducted the pre-test were employed in the Training and Development Program for Global Operations

at Fluor Corporation, a firm with whom the researcher was previously employed and the firm consistently ranked as the largest engineering and construction management firm in the world.

While the safety trainers at Fluor Corporation stated that they did not find the survey instrument items to be ambiguous, they did offer a few suggestions for improving the survey instrument. For example, they suggested that items be established to determine how comfortable and confident safety trainers feel when delivering safety training. Accordingly, these suggestions were incorporated into the survey instrument.

Finally, the survey instrument was sent to the Human Subjects Committee at Florida State University for approval. After receiving approval from the Human Subjects Committee, the survey instrument was ready for use in this study.

Administration of the Survey Instrument

After the survey instrument was approved by the Human Subjects Committee, it was prepared for distribution to the 200 largest construction firms in the U.S. The survey instrument, along with a cover letter, was mailed to the human resources managers at the 200 companies, inviting safety trainers from their respective companies to participate in the study (see the appendix for the cover letter and survey instrument). The cover letter explained the purpose of the study and noted the importance of the study to the U.S. construction industry. Directions for actually participating in the study were noted on the survey instrument, but each human resource manager was

asked to request that a safety trainer with their company participate in the study. The cover letter concluded by thanking the human resources managers for helping with the study.

Three weeks after the first mailing, a second mailing occurred. A cover letter, similar to the initial cover letter, and survey instrument were sent to the human resources managers whose safety trainers did not complete and return the survey instrument during the first mailing. After three additional weeks elapsed, the third mailing was conducted. The three mailings yielded the number of completed surveys noted in the table below.

TABLE 8

Survey Response

Mailing	Number of Completed Surveys
1	14
2	22
3	22
Total	58

Analysis of the Survey Instrument Data

The data for the first two research questions were analyzed after the completed survey instruments were collected from the three mailings. The data collected for the first research question addressed the specific individual demographic characteristics of safety trainers responding to the survey. These data were analyzed descriptively using measures of central tendency and

included frequency distributions, percentages, variances, and standard deviations. The data revealed information such as the gender of the safety trainers, race of safety trainers, educational level of safety trainers, and number of years safety trainers have worked in the construction industry.

The data collected for the second research question addressed the challenges that safety trainers experience when planning, delivering, and evaluating safety training programs. As with the first research question, the data for the second research question were analyzed descriptively using measures of central tendency. The data collected for this research question addressed challenges such as the perceived support that safety trainers receive from management and safety trainers' perception of their own abilities to perform their roles as safety trainers.

The third research question helped the researcher determine the relationships between selected specific individual demographic characteristics of safety trainers and the accident rates their trainees experience. For this research question, the researcher calculated the bivariate correlations of the following null hypotheses:

a. There is no relationship between company size and the accident rates experienced by the trainees of safety trainers.

b. There is no relationship between the number of hours of safety training safety trainers have received over the last 12 months and the accident rates their trainees experience.

c. There is no relationship between the level of education safety trainers have and the accident rates their trainees experience.

d. There is no relationship between the number of years of experience safety trainers have worked in the construction industry and the accident rates their trainees experience.

e. There is no relationship between the number of years safety trainers have worked in construction safety and the accident rates their trainees experience.

f. There is no relationship between the number of years safety trainers have delivered safety training and the accident rates their trainees experience.

Development of the Follow-up Interview

After all data were collected and analyzed that addressed the individual demographic characteristics of safety trainers, the challenges they experience when planning, delivering, and evaluating safety training programs, and the relationships between selected individual demographic characteristics of safety trainers and the accident rates that their trainees experience, a follow-up telephone interview was conducted to address the forth research question. The follow-up telephone interview was conducted to determine how safety trainers meet the challenges they experience when planning, delivering, and evaluating these safety training programs.

Gay (1996) suggests that researchers conducting inquiries such as telephone interviews, not attempt to rigorously control the outcome of the study, as is the case

with quantitative studies. Rather, studies involving telephone interviews should be more process-oriented. The specific topics to be discussed should be inductive in nature, allowing the specifics of the interviews to be established during the interview process itself. This approach allows for detailed information to be acquired (McMillan & Schumaker, 1997). However, the general topics and questions that were addressed were the same for each participant and were established from the findings of the survey instrument, as they related to the challenges safety trainers experience, with the ultimate purpose of determining how safety trainers meet any challenges found in this study. The supporting rationale for the questions that safety trainers were asked in the follow-up telephone interview is discussed in the next chapter, but the safety trainers were asked to do the following during the follow-up telephone interview:

1. Discuss why safety trainers feel that corporate management more strongly supports safety training than general management, or project management, and how you meet the challenges of having less supportive general management and project management.

2. Discuss why safety trainers feel that they are better at planning safety training than delivery and evaluating safety training and how trainers meet the challenges of being weaker in these areas of training.

Administration of the Follow-up Interview

After the data from the survey instrument were collected and analyzed, the follow-up telephone interview

was conducted. McMillan and Schumaker (1997) suggest that purposely selecting a small group of individuals to interview is appropriate when researchers want to gain in-depth knowledge regarding specific issues. Gay (1996) stated that there are no specific guidelines for establishing the number of participants that should be investigated in telephone interviews. For this study, nine of the 58 safety trainers who completed the survey instrument were selected and contacted via telephone to participate in the telephone interview.

Each interview was tape-recorded, and as Light, Singer, and Willet (1990) suggested, detailed notes were taken during and after the actual follow-up telephone interviews, some examples of which are shown in Appendix E. After each interview, reflective notes were made. The reflective notes included the researcher's interpretations, thoughts, comments, and ideas regarding responses that were made during the interviews (see Gay, 1996). The data then were ready to be analyzed.

Analysis of the Follow-up Interview Data

After the interview process was completed, the data were analyzed. Initially the notes were re-written exactly as stated from the notes that were taken during each interview. Common themes then were sought among the notes, as suggested by Marshall and Rossman (1999) and Light, Singer, and Willet (1990). After these themes were established, the notes were sorted under each established theme. Then the data associated with each theme were synthesized into narrative summaries (see Marshall &

Rossman, 1999; McMillan & Schumaker, 1997; and Leedy, 1992), with the summaries describing how safety trainers meet the challenges they experience.

Summary

This chapter presented the methodology used in this study. The design of the study was discussed, with the research questions and accommodating null hypotheses stated. A narrative was presented next that detailed the population investigated during the study. Sections then were presented regarding the development and administration of the survey instrument and the analysis of its accommodating data. Following, sections were presented regarding the development and administration of the follow-up telephone interview and the analysis of its data. The next chapter will present the findings of the study.

CHAPTER FOUR
FINDINGS OF THE STUDY

Introduction

This chapter describes the findings of the study. The specific individual demographic characteristics of safety trainers are noted initially. The challenges that safety trainers experience when planning, delivering, and evaluating safety training programs then are presented. Next, the relationships between the specific individual demographic characteristics of safety trainers and the accident rates of their trainees are presented. The chapter then describes how safety trainers attempt to meet the challenges they experience when fulfilling their roles in the construction industry.

Demographic Characteristics of Safety Trainers

The first research question of this study was developed to determine specific individual demographic characteristics of safety trainers who plan, deliver, and evaluate safety training programs in the largest construction firms in the United States. The data addressing this question were collected through the first 11 items on the survey instrument.

Earlier in the study, the researcher had planned to divide and analyze the data collected by company size.

However, after reviewing the collected data and consulting with one of the content experts in this study, it was decided to present the data more holistically since the industry typically isolates the top construction firms and disperses information regarding these firms collectively as a single group. Therefore, the data collected from these firms were analyzed collectively. For this research question, the data were analyzed descriptively using frequencies and percentages.

Fifty eight construction companies elected to be represented in this study. Of the companies represented, 12.1 percent of the companies grossed less than $250 million annually, and 46.6 percent of the companies grossed between $250 million and $500 million annually. The balance of the construction companies grossed over $500 million annually, with 24.1 percent of the companies grossing between $500 million and $999 million annually, and 17.2 percent of the companies grossing over one billion dollars annually. The distribution of the construction companies represented in this study is depicted in tabular format in Table 9.

TABLE 9

Distribution of Construction Companies

Company Size	Frequency	Percentage	n
Less than $250 Million	7	12.1	58
$250 - $500 Million	27	46.6	58
$500 - $999 Million	14	24.1	58
Over $1 Billion	10	17.2	58

Note: Company size is based on annual gross revenue.

Most safety trainers in this study were white males who earned over $70,000 annually. Fifty six of the safety trainers were white, one safety trainer was Native American, and one safety trainer did not respond to the item regarding race. Fifty two of the safety trainers were male, five safety trainers were female, and one safety trainer chose not to respond to this item. While forty two safety trainers earned over $70,000 annually, no safety trainers earned less than $40,000 annually. Two safety trainers earned between $41,000 and $50,000 annually, three safety trainers earned between $51,000 and $60,000 annually, and seven safety trainers earned between $61,000 and $70,000 annually.

Educationally, 37.9 percent of the safety trainers had earned a bachelor's degree, and 19.0 percent had earned a master's degree, for a total of 56.0 percent of the safety trainers having earned a college degree. No safety trainers stated that they had earned a specialist degree or doctoral degree. The majors for those earning a bachelor's degree and master's degree are noted in Table 10.

Safety trainers augmented their educations by receiving additional training, whether they had college degrees or only high school educations. Exactly one-half of them received more than 30 hours of safety training themselves last year. Additionally, 17.2 percent of the safety trainers received 21 to 30 hours of safety training, 13.8 percent received between 11 and 20 hours of safety training, and 15.5 percent received less than 10 hours of safety training.

TABLE 10

College Degree Majors

College Major	B.S.	n	M.S.	n
	%		%	
Business	6.9	4	5.2	3
Construction	1.7	1	0	0
Education	8.6	5	0	0
Engineering	6.9	4	0	0
Safety	20.7	12	10.3	6
Other	12.1	7	0	0

Note: Two safety trainers stated that they had earned a master's degree but did not state their majors.

While 84.5 percent of the safety trainers did not work full-time as a safety trainer, most safety trainers have worked several years in the construction industry, and many safety trainers have worked several years directly in construction safety. Many had worked several years actually delivering safety training. Table 11 depicts the experiences of the safety trainers:

TABLE 11

Experiences of Safety Trainers

Type Experience	<5yrs	6-10yrs	11-15yrs	16-20yrs	>20yrs
	%	%	%	%	%
Construction	5.2	17.2	15.5	13.8	48.3
Const. Safety	10.3	27.6	17.2	12.1	32.8
Safety Training	15.5	17.2	19.0	10.3	37.9

n=58

Challenges of Safety Trainers

Thirty seven items on the survey instrument allowed data to be collected regarding the challenges that safety trainers experience when planning, delivering, and evaluating safety training programs. The findings associated with these data are noted in the sections that follow.

Planning of Safety Training Programs

Safety trainers participating in this study felt that they have adequate resources to develop the training programs they prepare, particularly in terms of time and money. All but four of the safety trainers in this study stated that they have adequate time to prepare safety training programs, and all but two safety trainers stated that they receive adequate financial support.

While 41.4 percent of the safety trainers have received no education beyond high school, 74.1 percent of them have received training on how to conduct training needs assessments. Forty three safety trainers felt that the training needs assessments they conduct actually measure training "needs" rather than training "wants," although only 58.6 percent of the safety trainers stated that their trainees actually provided input into the selection of safety topics. Further, 98.3 percent of the safety trainers felt that they were at least "good" at planning safety training programs, with 89.7 percent stating that the training they develop reduces the number of construction accidents.

Corporate management appears to support safety training "very well" and do so better than general management, or so safety trainers felt. Moreover, only 19 percent of the safety trainers felt that project managers take safety training seriously, and 22.4 percent of the trainers felt that the typical trainee does not take training seriously. Table 12 and Table 13 present this information in more detail.

TABLE 12

Management Support of Safety Training

Type	Very well	Well	Not well	Not very well
	%	%	%	%
Corporate	86.2	13.8	0	0
General	65.5	29.3	5.2	0

n=58

TABLE 13

Seriousness of Safety Training

Group	Very seriously	Seriously	Not seriously	Not very seriously
	%	%	%	%
Typical Trainee	22.4	72.4	3.4	1.7
Project Manager	19.0	72.4	8.6	0

n=58

Delivery of Safety Training Programs

Fifty six of the safety trainers in this study arrive at their training locations at least 30 minutes prior to the scheduled start time of the training. Most safety trainers arrive at their training locations feeling very confident in their abilities to deliver the training program they have prepared. Refer to Table 14 below to review this is tabular format.

TABLE 14

Safety Trainer Confidence I

Confidence Level	Frequency	Percentage
Very confident	42	72.4
Confident	14	24.1
Not confident	1	1.7
Not very confident	0	0

n=58

Further, 98.3 percent of the safety trainers feel that they are either "very good" or "good" at delivering safety training programs. However, their confidence to deliver safety training programs appeared to waiver as additional questions were posed to them on the survey instrument. For instance, 53.4 percent of the safety trainers sometimes feel that they do not have the appropriate credentials necessary to deliver their safety training programs, and only 37.9 percent "almost always" feel like an expert in the training material they are presenting. Table 15 notes these issues in more detail.

TABLE 15

Safety Trainer Confidence II

	Almost always	Sometimes	Seldom	Almost never
	%	%	%	%
Feel nervous when training	12.1	22.4	20.7	41.4
Have inappropriate credentials	6.9	29.3	17.2	46.6
Feel like an expert	37.9	51.7	6.9	1.7

n=58

Safety trainers must arrive at their training locations prepared to train a variety of persons, some educated and some uneducated. Safety trainers train a) craft persons, b) foremen, c) superintendents, d) engineers, e) project managers, and f) other personnel. Table 16 outlines the number of hours of training that these employees, on average, each received over the last 12 months.

Employees directly involved with the actual activities on the jobsite received the most safety training. Craft persons received 16.16 hours of safety training, on average, and foreman received 21.33 hours of safety training. Superintendents received more safety training that any position, on average, receiving 26.4 hours of safety training over the last 12 months. Engineers and project managers averaged 14.98 hours and 17.88 hours of safety training, respectively.

TABLE 16

Hours of Training per Position

Position	Mean	Std. Deviation
Craft Persons	16.16	14.47
Foremen	21.33	21.23
Superintendents	26.40	26.37
Engineers	14.91	18.01
Project Managers	17.88	17.73
Others	6.12	8.15

n=58

Note: All positions are considered "general management" positions except for "craft persons" and "others". "Others" may include, but not be limited to, accountants, schedulers, estimators, secretaries, or any position not listed above.

Twenty six of the fifty eight safety trainers average 16 to 20 trainees in their class, and 18 safety trainers average 11 to 15 trainees per class. Six of the safety trainers average less than 10 trainees per class, and the seven other safety trainers average more than 20 trainees per class.

Safety trainers felt "very comfortable" (87.9 percent) or at least "comfortable" (12.1 percent) using common media equipment, such as VCRs, televisions, computers, projectors, and similar equipment. Regarding computer software, 57 safety trainers use Microsoft products, and 18 safety trainers use Corel products. Safety trainers did not feel as comfortable demonstrating the use of personal

protective equipment, such as safety harnesses and respirators, as they felt using common media equipment, however. Only 17.2 percent stated that they felt "comfortable" demonstrating the use of personal protective equipment.

Trainers used a variety of training strategies during delivery. Forty six safety trainers stated that they "almost always" share their personal experiences during actual training delivery, while 10 stated that they "seldom" share their personal experiences during training delivery. Additionally, 43.1 percent of the safety trainers "almost always" use humor during training, 43.1 percent "almost always" use open-ended questions, 12.1 percent "almost always" use small group activities, and 39.7 percent "almost always" correctly anticipate questions from trainees. Table 17 below notes these training strategies in detail.

TABLE 17

Training Strategies

	Almost always	Sometimes	Seldom	Almost never
	%	%	%	%
Share personal experiences	79.3	17.2	3.4	0
Use humor	43.1	51.7	5.2	0
Ask open-ended questions	43.1	48.3	5.2	0
Use small group activities	12.1	56.9	19.0	0
Correctly anticipate questions	39.7	58.6	0	0

n=58

Evaluation of Safety Training Programs

Forty nine safety trainers in this study stated that they had a means through which they evaluate the safety training programs they deliver, with 82.8 percent of the safety trainers stating that they "almost always" or "sometimes" ask trainees to complete training evaluations. Additionally, 94.9 percent of the safety trainers "almost always" of "sometimes" incorporate trainee feedback into future training programs.

The final item on the survey instrument regarding the challenges that safety trainers experience asked safety trainers how good they felt they were at evaluating safety training programs. Only 23 of the safety trainers stated that they were "very good" at evaluating safety training programs. Thirty safety trainers stated that they were only "good" at evaluating safety training programs, and three stated that they were "not very good."

Selected Demographic Characteristics versus Accident Rates

Through the third research question, relationships between selected specific individual demographic characteristics of safety trainers and the accident rates trainees experience were examined. The following hypotheses were developed and tested in the null format:

a. There is no relationship between company size and the accident rates experienced by the trainees of safety trainers.

b. There is no relationship between the education level of safety trainers and the accident rates their trainees experience.

c. There is no relationship between the number of hours of safety training safety trainers have received over the last 12 months and the accident rates their trainees experience.

d. There is no relationship between the number of years of experience safety trainers have in the construction industry and the accident rates their trainees experience.

e. There is no relationship between the number of years safety trainers have worked in construction safety and the accident rates their trainees experience.

f. There is no relationship between the number of years safety trainers have delivered safety training and the accident rates their trainees experience.

To examine these hypotheses the researcher used data collected through the last item on the survey instrument. That item allowed the accident rates of safety trainees to be determined. Given this rate, data could be analyzed.

Bivariate correlations were calculated using the Pearson product moment method to test the selected null hypotheses for statistical significance and determine these relationships. The relationships are noted in Table 18 and were characterized in this study using the following associations developed by Davis (1971):

Coefficient	Description
0.70 or higher	very strong association
0.50 to 0.69	substantial association
0.30 to 0.49	moderate association
0.20 to 0.29	low association
0.01 to 0.19	negligible association

TABLE 18

Correlations: Characteristics of Safety vs. Accident Rates

	r	Sig. (2-tailed)	n
Company Size	*-.328	.012	58
Educational Level	**-.440	.001	58
Trg. Hours Received	-.030	.826	58
Construction Exp.	.054	.689	58
Safety Exp.	.122	.363	58
Training Exp.	.146	.274	58

* Statistically significant at the .05 level.
** Statistically significant at the .01 level.
Note: Table represents the relationships between the demographic characteristics of the safety trainers in this study and the accident rates experienced by their trainees.

Two relationships out of the six relationships were found to be statistically significant. Therefore, the researcher rejected two of the null hypotheses and failed to reject the other four null hypotheses.

The relationship between the size of the construction company employing the safety trainers and the accident rates trainees experience was calculated to be -.328 (p=.012). As company size increased, accident rates of trainees decreased. The relationship was considered to have a moderate association per the scale developed by

Davis (1971), and the relationship was statistically significant at the .05 level.

The relationship between the educational levels of safety trainers and the accident rates their trainees experience also was considered to have a moderate association (r=-.440, p=.001) and was statistically significant at the .01 level. As the educational levels of safety trainers increased, the accident rates of their trainees decreased. However, there was no significant correlation found between the number of hours of safety training that safety trainers received over the last year and the accident rates of their trainees (r=-.030, p=.826). The relationship was considered negligible.

Three other relationships were investigated as part of the third research question. The hypotheses involved the relationships between the accident rates experienced by trainees and a) the number of years safety trainers have worked in the construction industry, b) the number of years safety trainers have worked in construction safety, and c) the number of years safety trainers have delivered construction safety training. However, these experience levels did not correlate significantly with the accident rates experienced by their trainees, and their associations were considered negligible.

Meeting the Challenges

The manner in which safety trainers met the challenges they experience when planning, delivering, and evaluating safety training programs was investigated through the fourth research question. The manner in which they met

their challenges was investigated through a follow-up telephone interview.

Nine safety trainers were selected from the 58 safety trainers completing the survey instrument to be interviewed. The demographic characteristics of the nine safety trainers participating in the follow up telephone interview are noted in Table 19 below:

TABLE 19

Demographic Characteristics of Safety Trainers in Follow-up Telephone Interviews

Demographic Characteristic	Safety Trainer								
	1	2	3	4	5	6	7	8	9
Company Size	<250	250-500	250-500	250-500	250-500	500-999	500-999	>1	>1
Educ. Level	HS	BS	HS	HS	MS	BS	HS	HS	MS
Const. Exp.	>20	<5	11-15	>20	6-10	<5	11-15	>20	>20
Safety Exp.	>20	<5	11-15	11-15	6-10	<5	11-15	11-15	>20
Safety Trg. Exp.	>20	>20	11-15	11-15	6-10	<5	11-15	11-15	>20

Note: Units for company size are millions of dollars for participants 1-7 and billions of dollars for participants 8 & 9.
Units for experience are years.
"H.S." represents those safety trainers who have only a high school education.

Each of the safety trainers was asked to discuss the challenges they experience. Special attention was given to those challenges that became apparent to the researcher

when the data were collected and analyzed. The first challenge that appeared to be most apparent involved management's support of safety training. While 86.2 percent of the 58 safety trainers completing the survey instrument felt that corporate management supported safety training "very well," only 65.6 percent felt that general management, i.e. project managers, engineers, and superintendents, supported safety training "very well." This difference was tested using a one-sample t-test and found to be significant at the .01 level ($x1=3.86$; $x2=3.60$; $t=5.738$, $df=57$, $p=.000$). This finding was supported by the fact that 91 percent of the safety trainers in this study felt that project managers did not take safety training as seriously as they should.

Regarding this challenge, safety trainers were asked to discuss why they felt that corporate management more strongly supports safety training than general management and how they have met this challenge. The common theme that evolved during the follow-up telephone interviews centered on the different roles and subsequent responsibilities of persons in each type of management position, whether in corporate or general management positions. One safety trainer stated, "Project managers [general management] are the profit and loss guys...working under deadlines with penalty clauses and incentive clauses. Their job is to get the job done, and safety sometimes gets in the way." This was stated more plainly by another safety trainer: "The production guys struggle to meet the safety requirements dictated by the corporate guys." "Upper management does not have to actually implement safety [programs]."

Further, while general management, i.e., project managers, engineers, and superintendents, is "getting the job done," corporate management is making company policy and "mandating" that it be implemented. "It's easy for corporate [management] to support safety. They just say, "Do it."" Stated more directly by another safety trainer, "They get into corporate management and forget what it takes to make safety happen." "They [corporate managers] just provide money."

The most common approach that safety trainers said they used to overcome the support level offered by general management was to "State the requirements... why the requirements are necessary... and make sure they understand the requirements." Stated a little differently, "Show how the training adds value to the success of the project... and always discuss progress made." Remember, "We are looking for long-term gains."

During the course of analyzing the data that were collected through the survey instrument, another challenge that safety trainers experience became apparent. This challenge focused on the perceptions that safety trainers had regarding their abilities to plan, deliver, and evaluate safety training programs. Table 20 notes how "good" safety trainers felt they were at planning, delivering, and evaluating safety training programs. This table is noted below:

Table 20

Perceived Abilities of Safety Trainers

Task	Very Good	Good	Not Very Good
	%	%	%
Planning Training	50.0	48.3	1.7
Delivering Training	50.0	48.3	1.7
Evaluating Training	39.7	51.7	5.2

While one-half of the safety trainers felt that they were "very good" at planning and delivering safety training programs, only 39.7 percent stated that they were "very good" at evaluating safety training programs. The differences between how good safety trainers felt they were at 1) planning versus evaluating and 2) delivering versus evaluating safety training programs were tested using a one-sample t-test and found to be significant at the .01 level and .05 level, respectively (planning: $\bar{x}=2.48$, $t=2.872$, $df=57$, $p=.006$; delivering: $\bar{x}=2.47$; $t=2.360$, $df=57$, $p=.022$; and evaluating: $\bar{x}=2.28$).

The common theme that developed as to why safety trainers felt they were better at planning and delivering safety training programs than evaluating safety training programs centered around the safety trainer's own understanding of training evaluation. As one safety trainer stated, "This is a given. Trainers often cannot evaluate as well as they plan and deliver," possibly because they stated that they do very little actual measurement-type activities and, thus, do not feel comfortable. Stated by another safety trainer, "It is one thing to plan and deliver and another to evaluate." One

safety trainer simply said, “Trainers don’t know how to evaluate better because they don’t know how. They need to be trained,” and as another safety trainer described it, “They need to be trained and re-trained.” “They select their senior field people to do training, but these guys do not feel comfortable standing in front of a large group...” The statement noted most often during this part of the interviews was, “They’ve got to be trained.”

Three of the nine safety trainers stated that they overcome the challenges of not being as good at training evaluation by requiring their safety trainers to complete train-the-trainer workshops. One safety trainer stated that they require new trainers to attend the safety class they will teach “several times before they actually begin teaching it.”

One safety trainer stated that they “try to involve our people” in training. “Nobody cares how much you know until they know how much you care.” Another safety trainer further noted that they often pair a good trainer with a superintendent, allowing the trainer to facilitate the training and the construction superintendent to serve as a content expert. This same safety trainer noted that this also had a positive affect on craft persons. Craft persons “see their superintendent supporting safety and follow suit.” Above all, perhaps one safety trainer summed up safety training best: “You cannot expect an employee to work safe[ly] unless you tell them what safe work is.”

Summary

This chapter presented the findings of the study. Discussions for these findings were presented sequentially in the order that each research question appeared in the study. It was determined that most safety trainers were white males with more than 20 years of construction experience. Most safety trainers worked for companies grossing between $250 million and $500 million annually. Slightly over one-half of the safety trainers had earned a bachelor's degree.

Safety trainers felt that corporate management more strongly supported safety training than did general management. Safety trainers also felt that they were better at planning and delivering safety training programs than they were at evaluating safety training programs. Both of these challenges were found to be statistically significant. Also, the chapter discussed how safety trainers met these challenges.

The study revealed that company size inversely correlated significantly with accident rates of trainees. As company size increased, the accident rates of trainees decreased. Also, the educational level of safety trainers inversely correlated significantly with the accident rates of trainees. As the educational level of safety trainers increased, accident rates of their trainees decreased. However, additional training, i.e. safety training seminars, safety trainers received had no significant correlation with accident rates of trainees.

CHAPTER FIVE
CONCLUSIONS AND RECOMMENDATIONS OF THE STUDY

Introduction

The traditional approach in reducing construction accidents has been to implement effective safety training programs (Hinze & Harrison, 1981). This study was an investigation of the trainers who plan, deliver, and evaluate these safety training programs. The study investigated specific individual demographic characteristics of safety trainers, the challenges they experience when planning, delivering, and evaluating safety training programs, the relationships between selected specific individual demographic characteristics of safety trainers and the accident rates that their trainees experience, and how safety trainers meet the challenges they experience. This chapter presents the conclusions that were drawn from the findings of this investigation, and it presents recommendations of the study for those who engage in supporting and delivering safety training in large construction companies.

Conclusions

Conclusions drawn from the findings of the study are presented as they relate to their individual research question. The major findings are noted for each research

question, and then conclusions are made based on these findings.

Research Question 1 The first question guided the researcher in addressing the specific individual demographic characteristics of safety trainers who work for large construction firms in the United States. Although there were several findings for this question noted in the previous chapter, the major findings that allow conclusions to be drawn for the construction industry and vocational education are:

1. Twenty four of the 58 safety trainers had only a high school education.

2. Only five safety trainers had a bachelor's degree in education.

3. No safety trainers had a master's degree in education.

The findings of this study support Swanson and Faulk's comments in 1997 regarding the lack of college graduates among trainers. However, these findings do not support the findings from McCullough's 1987 study or Olson's 1994 study of trainers. McCullough found that 89 percent of the trainers in his study had at least a bachelor's degree. Eighteen percent of those trainers had a bachelor's degree in education, and 32 percent had a master's degree in education. Olson found that 63.6 percent of the 56 trainers in his study had graduate degrees in education.

In this study, only 56.9 percent of the safety trainers had a college degree. Thirty eight percent of the safety trainers had a bachelor's degree and 19 percent had a master's degree. Only five safety trainers had a bachelor's degree in education, and no safety trainers had

a master's degree in education. In fact, 24 of the 58 trainers in this study had only a high school education.

Based upon the findings of this study, the top 200 construction firms may lag behind the training industry as a whole with respect to the number of safety trainers having college educations. However, studies regarding trainers are limited (see Sleezer, 1992; Swanson & Faulkman, 1997; and Knowles, 1984). Certainly a study that used a larger sample size may have yielded different results. Nonetheless, the trainers in this study appeared to be ill-prepared educationally to perform their roles in the workplace.

Dare and Leach (1997) noted 19 areas in which vocational educators must understand to perform their training roles effectively, some of which included adult learning, competency identification, training and development, evaluation, and organizational behavior. Although it is not impossible, it is very unlikely that a safety trainer can acquire the competencies and skills within these areas through on-the-job training alone. Thus, vocational education programs are presented with an opportunity to capitalize upon these apparent deficiencies among safety trainers. Vocational education programs are ideally suited to better prepare persons to fulfill these roles in the construction industry, as these programs typically teach the competencies and skills that safety trainers need to fulfill their roles in industry.

Research Question 2 The second research question focused on determining the challenges that safety trainers experience when planning, delivering, and evaluating safety

training programs. Among the challenges found in this study, the major findings are:

1. Safety trainers believed that they received more support from corporate management than from general management, i.e. project managers, engineers, and superintendents.

2. Safety trainers believed that they were better at planning and delivering safety training programs than they were at evaluating safety training programs.

No research was found in the literature that directly supported or differed with the findings regarding the support that safety trainers receive from management. However, this study found that there was a statistically significant difference between the perceived support that safety trainers received from corporate management versus that received from general management, i.e. project managers, engineers, and superintendents (t=5.738, df=57, p=.000).

Regardless of whether there exists, in actuality, a difference between the support that safety trainers received from corporate management versus that received from general management, safety trainers perceived this difference to be real. While it was not the intent of this study to investigate causation, this difference may be attributed to numerous reasons. Based upon the researcher's experience with these large construction firms, this difference does seem to exist and may be attributed to the different roles that each management-type plays in the construction process. For example, while corporate management attempts to ensure that the company as a whole earns a profit, in the end, profit is made at the

project level, a level within the hierarchy that is managed by general management, e.g. project managers. Unfortunately, safety training is often viewed as a necessary evil that is not directly linked to project success. Worse, safety is often blatantly neglected on the jobsite (Smith & Roth, 1991).

To the casual observer, these differences may appear to have very little to do with vocational education. However, vocational education programs must prepare trainers for dealing with situations such as this. In fact, Dare and Leach (1997) determined that vocational educators, i.e. trainers, must have competencies and skills in the area of organizational behavior. Additionally, trainers must clearly understand employee behavior, understand organizational behavior, be able to implement and manage change in the workplace (Leach and Sandall 1995), and understand industrial psychology (Kaeter, 1995). Perhaps not surprisingly, competencies and skills in these areas will not be learned on the job. Safety trainers must acquire these skills through formal programs in education.

Another major finding that was associated with the second research question was that safety trainers believed that they were better at planning and delivering safety training programs than they were at evaluating them. Exactly one half of the safety trainers in this study believed that they were "very good" at planning and delivering safety training programs, but only 39.7 percent believed that they were "very good" at evaluating safety training programs, though 49 of the 58 trainers stated that they had a means through which they evaluate their training.

It was not the intent of this study to determine why this perceived difference existed. However, it is of limited value to these 200 construction firms for safety trainers to develop and deliver safety training without fully evaluating its effectiveness. Construction companies must link safety training to the performance of each construction project and to the company as a whole.

Once again, vocational programs are best equipped to prepare trainers for evaluating safety training programs and thus, for helping trainers link their training to project and company performance. Only then will safety professionals realize the benefits of their efforts.

Research Question 3 The third research question allowed findings to be established regarding the relationships between selected individual demographic characteristics of safety trainers and the accident rates of their trainees. There were six null hypotheses established for this research question, and the findings from all six null hypotheses are considered major findings, even though four were not found to be significant at the .05 level. These findings are:

1. As company size increased, the accident rates of trainees decreased (r=-.328, p=.012).

2. As the educational levels of safety trainers increased, the accident rates of trainees decreased (r=-.440, p=.001).

3. There was no statistically significant relationship between the yearly amount of safety training that safety trainers received and the accident rates of their trainees (r=-.030, p=.826).

4. There was no statistically significant relationship between the number of years of construction experience that safety trainers have and the accident rates of their trainees (r=.054, p=.690).

5. There was no statistically significant relationship between the number of years of safety experience that safety trainers have and the accident rates of their trainees (r=.122, p=.363).

6. There was no statistically significant relationship between the number of years safety trainers have delivered safety training and the accident rates of their trainees (r=.146, p=.274).

The 200 construction companies in this study were all considered to be "large" construction companies. However, the largest companies among these 200 had lower accident rates than the smaller companies in this study. As company size increased, the accident rates of trainees decreased.

Although there was no research found in the literature by which the findings for this research question could be compared, the researcher expected company size to negatively correlate significantly with the accident rates of trainees based on his experience with these firms. Larger companies typically have greater resources to use on programs, such as safety, than do smaller companies.

Additionally, it was concluded that the educational levels of safety trainers significantly correlated negatively with the accident rates of their trainees (p<.05). As the educational levels of safety trainers increased, the accident rates of their trainees decreased. However, the number of hours of additional safety training that trainers received through seminars during the past 12

months did not correlate with the accident rates of trainees ($p>.05$).

The experience levels of safety trainers also did not correlate significantly with the accident rates of trainees. The number of years of a) construction experience, b) safety experience, and c) safety training delivery experience all had relationships that were not significant ($p>.05$).

However, while the findings suggest that the educational levels of safety trainers play a role in safety, these particular findings do not suggest that the experience that trainers have acquired plays a role in safety. In fact, the relationships between the accident rates of trainees and a) construction experience, b) safety experience, and c) safety training delivery experience were considered to be negligible and not significant at the .05 level ($r=.054$; $r=.122$; and $r=.146$, respectively).

These findings may suggest that the education of safety trainers is more important than the experience trainers have in terms of the accident rates that trainees experience, although certainly there can be numerous contributing factors associated with accident rates. However, construction companies should consider the educational levels of safety trainers carefully when developing and implementing safety programs. Regarding vocational education programs, these findings stress the importance of having educated safety trainers in the workforce and the need for vocational education programs to develop trainers who will serve in industry.

Research Question 4 The researcher sought to gain an understanding as to how safety trainers meet the challenges

they experience when planning, delivering, and evaluating safety training programs. The specific challenges that were investigated for this research question involved how safety trainers met a) the challenges associated with receiving less support from general management than corporate management, and b) the challenges associated with their believing they were not as good at evaluating safety training programs as they were at planning and delivering safety training programs. The major findings for this research question are:

1. Safety trainers met the perceived lack of support they received from general management, i.e. project managers, engineers, and superintendents, by showing how the training adds value to the success of the project.

2. Safety trainers met their perceived lack of abilities to evaluate safety training programs by training their trainers.

Safety trainers were asked during the follow-up telephone interview how they met challenges associated with receiving less support from general management than corporate management. The common theme that developed in response to this question was that safety trainers regularly tried to show their trainees how safety training adds value to the success of their projects. "State the requirements…why the requirements are necessary…and make sure they understand the requirements."

Several comments were made by safety trainers of which corporate managers at these top firms should be aware. One safety trainer stated that "…safety sometimes gets in the way [of completing the construction work]." While project

managers are "getting the job done," "corporate managers have forgotten what it takes to make safety happen."

Safety trainers also were asked how they met challenges associated with their perceived lack of abilities to evaluate safety training programs. Collectively, their response was to "train the trainer."

One safety trainer stated that they actually objectively measure employee performance so seldom that they simply do not feel comfortable with such issues. Although this was the only direct comment related to this made, it became apparent during the interview process that very little, if any, performance-based evaluations were being conducted by safety trainers. As one safety trainer stated, "We really do very little in the way of evaluating our performance." At most, safety trainers required trainees complete training "evaluations." Unfortunately, most training evaluations are subjective and do not allow for criterion-based assessments to be made regarding knowledge and skill transfer. Additionally, it did not appear that safety training, itself, was linked directly to project performance or company performance, creating more challenges for trainers and those within the hierarchy of construction management.

Recommendations

There were several recommendations worth noting that the researcher established during and after this study was completed. These recommendations describe how this study could have been improved and notes areas of vocational

education and construction safety training that need additional investigation.

Recommendation 1 This study limited its population to the top 200 construction firms in the United States. While most studies limit the population, this study may have yielded different findings if there had been a way to select a sample from construction companies of all sizes levels operating within the U.S. A more comprehensive study, one that would require greater resources, might have yielded quite different findings. Vocational educators should develop a study similar to this study that includes a sample from a larger group of construction firms in the U.S.

Recommendation 2 Vocational educators who prepare individuals for careers in construction safety should be aware of these apparent deficiencies in the area of evaluation so that curriculum can be altered to accommodate these shortcomings. Additionally, construction companies in this study must begin to measure the effectiveness of their safety training programs and link training directly to employee, project, and company performance.

Recommendation 3 This study should have placed greater emphasis on the abilities of safety trainers to actually evaluate the training they develop and present. Based upon data collected through the interviews, little effort by safety trainers is being spent evaluating the effectiveness of the training they present.

Recommendation 4 A criterion-referenced instrument would have yielded more objective findings. Although the scope of a study such as this would have required resources in time and money significantly beyond that of which the

normal dissertation process allows, in a future study vocational educators could determine the types of accidents that occur most frequently by using OSHA's databases. They could then synthesize this information with qualitative data that were collected through a Delphi technique that used both vocational educators in academia and trainers in industry to determine the knowledge and skills that safety trainers need to be effective. This essential knowledge and skill could then be developed into criterion-referenced instruments that could objectively access the ability and performance levels of safety trainers. Researchers and practitioners could then begin to determine causal links between the abilities and performances of safety trainers and accident rates and thus, significantly impact construction safety.

Recommendation 5 The researcher in this study might have been able to determine more specific challenges that safety trainers experience had he used a method of inquiry that was primarily qualitative in nature. For example, he could have investigated safety trainers at a single company. While a study such as this may not be representative of safety trainers as a whole, it would have required specific data to be collected that could serve as a baseline for additional research that could be used in vocational education programs.

Recommendation 6 Additional research needs to be conducted to investigate in detail issues associated with the perceived lack of support that safety trainers receive from general management, specifically the perceived lack of support they receive from project managers.

Recommendation 7 This study found no significant relationships between the experience levels of safety trainers and the accident rates of trainees. Additional research should be conducted to further determine why these relationships did not correlate significantly.

Recommendation 8 Vocational educators should develop a study that limits its scope to understanding the relationships between the educational levels of safety trainers and the accident rates of trainees. This study found that a significant relationship did exist between the educational levels of safety trainers and accident rates of trainees, but additional work is required to understand specific issues associated with this relationship.

Recommendation 9 This study found that there was a significant inverse relationship between company size and the accident rates of trainees. Additional research should be conducted to understand specific differences between the safety programs and their trainers at the larger firms versus the safety programs and the trainers at "smaller" firms.

Recommendation 10 This study found that there was a significant difference between safety trainers' perceived abilities to plan and deliver safety training programs and their perceived abilities to evaluate safety training programs. Vocational educators should develop a study to investigate these perceived differences. This could lead to significant improvements in construction safety training.

Final Thoughts

In conclusion, this study demonstrated that there remain serious issues that need addressing regarding construction safety. The researcher has seen the seriousness of these issues through this study and firsthand through the course of his career in the U.S. construction industry.

On the researcher's first construction project, he watched a welder use a torch to cut a structural member in two for a stay-cabled suspension bridge project that was under construction. As the loaded member was weakened due to the cutting, the member sheared, and as it did the welder's arm was literally ripped from his body, leaving him to dangle to life using his safety harness.

Unfortunately, this accident is only one of numerous accidents the researcher has witnessed. Within the past 2 months, a safety inspector on a local construction project fell 3 stories to his death due to a careless act.

The researcher also regularly serves as an expert witness in court cases involving construction accidents, some of which involve the death of individuals. In this capacity, he has relived these accidents with the families of the victims and the companies that employed them.

Based upon the researcher's background, every single accident he has witnessed could have been avoided. Those of us in the construction industry and those of us who support construction safety must take drastic steps to improve construction safety. Someone simply must "step up to the plate" to improve construction safety. No project is worth someone's life.

Vocational education programs have a unique opportunity be that “someone.” Vocational educators must get involved with the construction industry -- conduct research, go to the construction sites, get to know the safety trainers and understand the challenges they experience, and help improve construction safety. One death is one death too many.

Safety Training Survey

Florida State University

Directions: Please help us continuously improve construction safety by completing this survey.

Demographics

What is your company's annual gross revenue?
___ less than $250 Million
___ $250-$500 Million
___ $500-$999 Million
___ more than $1 Billion

What is your gender? ___ male ___ female

What is your race?
___ Asian ___ Native American
___ Black ___ Multiracial
___ Hispanic ___ White (non-Hispanic)

What is your approximate annual income?
___ less than $40,000 ___ $61,000 - $70,000
___ $41,000 - $50,000 ___ more than $70,000
___ $51,000 - $60,000

What is the highest formal degree you have completed?
___ less than high school ___ master's degree
___ high school diploma ___ specialist degree
___ associate's degree ___ doctoral degree
___ bachelor's degree

State the area that best describes each degree.
Example:

___ business	___ business
___ construction	___ construction
MS education	___ education
___ engineering	___ engineering
BS safety	___ safety
___ other	___ other

How long have you worked in construction?
___ less than 5 yrs ___ 16-20 yrs
___ 6-10 yrs ___ more than 20 yrs
___ 11-15 yrs

How long have you worked in construction safety?
___ less than 5 yrs ___ 16-20 yrs
___ 6-10 yrs ___ more than 20 yrs
___ 11-15 yrs

How long have you actually delivered safety training?
___ less than 5 yrs ___ 16-20 yrs
___ 6-10 yrs ___ more than 20 yrs
___ 11-15 yrs

Do you work full-time as a safety trainer?
___ yes ___ no

About how many clock hours of safety training did you receive over the last year?
___ less than 10 hrs ___ 21-30 hrs
___ 11-20 hrs ___ more than 30 hrs

Planning, Delivery & Evaluation

Do you have adequate time to prepare training programs?
___ yes ___ no

Have you ever received formal training on how to conduct training needs assessments?
___ yes ___ no

How often do you conduct training needs assessments prior to developing new training programs?
___ almost always ___ seldom
___ sometimes ___ almost never

Do you feel that your training needs assessments measure training "needs" or training "wants?"
___ training "needs" ___ training "wants"

How often do trainees provide input into the selection of training topics?
___ almost always ___ seldom
___ sometimes ___ almost never

Does the training you provide reduce the number of accidents?
___ yes ___ no

How well does corporate management support safety training?
___ very well ___ not well
___ well ___ not very well

How well does general management support safety training?
___ very well ___ not well
___ well ___ not very well

Does your company provide adequate financial support for safety training?
___ yes ___ no

In general, how good would you say you are at planning safety training?
___ very good
___ good
___ not very good

How seriously do your trainees take safety training?
___ very seriously ___ not seriously
___ seriously ___ not very seriously

How seriously do project managers take safety training?
___ very seriously ___ not seriously
___ seriously ___ not very seriously

About how early do you arrive to the training site?
___ at the start time ___ 30 minutes
___ 15 minutes ___ more than 30 minutes

How confident do you feel when delivering safety training?
___ very confident ___ not confident
___ confident ___ not very confident

How often do you feel nervous when delivering training?
___ almost always ___ seldom
___ sometimes ___ almost never

How often do you feel that you do not have the appropriate credentials?
___ almost always ___ seldom
___ sometimes ___ almost never

How often do you feel like you are an expert in the topic you are delivering?
___ almost always ___ seldom
___ sometimes ___ almost never

How often do you share your personal experiences during training delivery?
___ almost always ___ seldom
___ sometimes ___ almost never

About how many of your trainees speak English?
___ less than 25% ___ 51-75%
__ 25-50% ___ more than 75%

How often do you use persons as translators?
___ almost always ___ seldom
___ sometimes ___ almost never

About how many clock hours per person of safety training did persons in each position noted below receive over the last year?
Example:
20 craft persons ___ craft persons
24 foremen ___ foremen
26 superintendents ___ superintendents
16 engineers ___ engineers
26 project managers ___ project managers
6 other personnel ___ other personnel

What software packages do you use to deliver training?
___ Word ___ Word Perfect
___ Excel ___ Quattro Pro
___ Power Point ___ Presentations

How motivated are trainees during training?
___ very motivated ___ not motivated
___ motivated ___ not very motivated

How often do you use humor as a motivational tool?
___ almost always ___ seldom
___ sometimes ___ almost never

How often do you ask open-ended questions?
___ almost always ___ seldom
___ sometimes ___ almost never

About how many trainees are in each class?
___ less than 10 ___ 16-20
___ 11-15 ___ more than 20

How often do you use small groups activities?
___ almost always ___ seldom
___ sometimes ___ almost never

How comfortable do you feel adjusting the content of training during delivery?
___ very comfortable
___ comfortable
___ not very comfortable

How often do you correctly anticipate questions from trainees?
___ almost always ___ seldom
___ sometimes ___ almost never

How comfortable do you feel telling trainees you do not know the answer to their questions?
___ very comfortable
___ comfortable
___ not very comfortable

Overall, how comfortable do you feel using media equipment, such as VCRs, televisions, computers, projectors, and similar equipment?
___ very comfortable
___ comfortable
___ not very comfortable

Overall, how comfortable do you feel demonstrating the use of safety equipment, such as harnesses, respirators, and similar equipment?
___ very comfortable
___ comfortable
___ not very comfortable

In general, how good would you say you are at <u>delivering</u> safety training?
___ very good
___ good
___ not very good

Do you have a means through which you evaluate the safety training you deliver?
___ yes ___ no

How often do you ask trainees to complete training evaluations?
___ almost always ___ seldom
___ sometimes ___ almost never

How often do you incorporate trainees' feedback into training?
___ almost always ___ seldom
___ sometimes ___ almost never

In general, how good would you say you are at <u>evaluating</u> safety training?
___ very good
___ good
___ not very good

For every 1,000 employees that you trained on safety-related topics over the last 12 months, regardless of the clock hours each employee received and the specific content of the training, how many employees were involved in a construction-related accident over that same 12-month period?
___ employees per 1,000 employees trained

Thank you for participating in this study. Please return the signed consent form and completed survey to:

Herbert M. Barber, Jr.
1829 Laurel Oak Drive
Statesboro, GA 30461

Appendix B

Survey Instrument Specification

Overview

In general, the survey instrument specification will serve as a guide for the researcher to follow during the development of the survey instrument that will be used in this study.

Purpose of the Survey Instrument

A survey instrument will be developed for this study using this survey instrument specification. The survey instrument will allow the researcher to collect all necessary data for fulfilling the purpose of the study. Specifically, the survey instrument will be developed to address two of the three research questions of this study.

Time Limitations

The survey instrument should take each participant approximately 15 minutes to complete.

Survey Instrument Administration

At the completion of the development of the survey instrument specification, the survey instrument will be developed. After the survey instrument is developed and approved by the Human Subjects Committee, the survey

instrument will be prepared for the three mailings to the participants of the study.

The first mailing will be reproduced and mailed, along with a cover letter, to the human resources managers at the top 200 construction firms in the United States, with each human resources manager being asked to request that a safety trainer within their respective construction firm participate in this study.

After three weeks have been allowed to elapse, the second mailing will occur. In the second mailing, the survey instrument, along with a cover letter similar to the initial cover letter, and return envelope, will be mailed to the human resources managers who did not have safety trainers participate in the study.

The third and final mailing will occur after three weeks have been allowed to elapse from the second mailing. The third mailing will occur similarly to the second mailing.After nine weeks, total, have elapsed, the data will be analyzed.

Content Areas to be Measured

There are two content areas that will be measured, including:

a. specific individual demographic characteristics of safety trainers working in the U.S. construction industry,

b. challenges that safety trainers experience when planning, delivering, and evaluating safety training programs in the U.S. construction industry.

Objectives and Items for Research Questions

Research Question 1

What are the specific individual demographic characteristics of safety trainers working in the U.S. construction industry?

Objective for Research Question 1

The objective for the first research question is to determine specific individual demographic characteristics of safety trainers working in the U.S. construction industry.

Items for Research Question 1

The following items will be used to collect data for the first research question. Also shown is the coding of each scale.

1. What is your company's approximate annual gross revenue?

(1) more than $1 billion
(2) $500–$999 million
(3) $250–$500 million
(4) less than $250 million

2. What is your gender?

(1) male (2) female

3. What is your race?

(1) Asian

(2) Black (non-Hispanic)

(3) Hispanic

(4) Native American

(5) Multiracial

(6) White (non-Hispanic)

3. What is your approximate annual income?

(5) less than $40,000

(4) $41,000-$50,000

(3) $51,000-$60,000

(2) $61,00-$70,000

(1) more than $70,000

4. What is highest formal degree you have completed?

(7) less than high school

(6) high school diploma

(5) associate's degree

(4) bachelor's degree

(3) master's degree

(2) specialist's degree

(1) doctoral degree

5. State the area that best describes each degree.

(1) business

(2) construction

(3) education

(4) engineering

(5) safety

(6) other

6. How long have you worked in construction?

(5) less than 5 years

(4) 6–10 years

(3) 11–15 years

(2) 16–20 years

(1) more than 20 years

7. How long have you worked in construction safety?

(5) less than 5 years

(4) 6–10 years

(3) 11–15 years

(2) 16–20 years

(1) more than 20 years

8. How long have you actually delivered safety training?

(5) less than 5 years

(4) 6–10 years

(3) 11–15 years

(2) 16–20 years

(1) more than 20 years

9. Do you work full time as a safety trainer?

(1) yes (2) no

10. About how many clock hours of safety training did you receive over the last year?

(4) less than 10 hours

(3) 11–20 hours

(2) 21–30 hours

(1) more than 30 hours

Research Question 2

What are the challenges that safety trainers experience when planning, delivering, and evaluating safety training programs in the U.S. construction industry?

Objective for Research Question 2

The objective for the second research question is to determine the challenges that safety trainers experience when planning, delivering, and evaluating safety training programs in the U.S. construction industry.

Items for Research Question 2

1. Do you have adequate time to prepare training programs?

(1) yes (2) no

2. Have you received formal training on how to conduct training needs assessments?

(1) yes (2) no

3. How often do you conduct training needs assessments prior to developing new training programs?

(1) almost always

(2) sometimes

(3) seldom

(4) almost never

4. Do you feel that your training needs assessments measure "training needs" or training "wants?"

(2) training needs

(1) training wants

5. How often do trainees provide input into the selection of training topics?

(1) almost always

(2) sometimes

(3) seldom

(4) almost never

6. Does the training you provide reduce the number of accidents?

(1) yes

(2) no

7. How well does corporate management support safety training?

(1) very well

(2) well

(3) not well

(4) not very well

8. How well does general management support safety training?

(1) very well

(2) well

(3) not well

(4) not very well

9. Does your company provide adequate financial support for safety training?

(1) yes

(2) no

10. In general, how good would you say you are at planning safety training?

(1) very good

(2) good

(3) not very good

11. How seriously do trainers take safety training?

(1) very seriously

(2) seriously

(3) not seriously

(4) not very seriously

12. How seriously do project managers take safety training?

(1) very seriously

(2) seriously

(3) not seriously

(4) not very seriously

13. About how early do you arrive at the training site?

(4) at the start time

(3) 15 minutes

(2) 30 minutes

(1) more than 30 minutes

14. How confident do you feel when delivering safety training?

(1) very confident

(2) confident

(3) not confident

(4) not very confident

15. How often do you feel nervous when delivering training?

(1) almost always

(2) sometimes

(3) seldom

(4) almost never

16. How often do you feel that you do not have the appropriate credentials?

(1) almost always

(2) sometimes

(3) seldom

(4) almost never

17. How often do you feel like you are an expert in the topic you are delivering?

(1) almost always

(2) sometimes

(3) seldom

(4) almost never

18. How often do you share your personal experiences during training delivery?

(1) almost always

(2) sometimes

(3) seldom

(4) almost never

19. About how many of your trainees speak English?

(1) less than 25%

(2) 25-50%

(3) 51-75%

(4) more than 75%

20. How often do you use persons as translators?

(4) almost always

(3) sometimes

(2) seldom

(1) almost never

21. About how many clock hours per person of safety training did persons in each position noted below receive over the last year?

(1) craft persons

(2) foreman

(3) superintendents

(4) engineers

(5) project managers

(6) other office personnel

22. What software packages do you use to deliver training?

(1) Word

(2) Excel

(3) Power Point

(4) Word Perfect

(5) Quattro Pro

(6) Presentations

23. How motivated are trainees during training?

(4) very motivated

(3) motivated

(2) not motivated

(1) not very motivated

24. How often do you use humor as a motivational tool?

(1) almost always

(2) sometimes

(3) seldom

(4) almost never

25. How often do you use open-ended questions?

(1) almost always

(2) sometimes

(3) seldom

(4) almost never

26. About how many trainees are in each class?

(4) less than 10

(3) 11-15

(2) 16-20

(1) more than 20

27. How often do you use small group activities?

(1) almost always

(2) sometimes

(3) seldom

(4) almost never

28. How comfortable do you feel adjusting the content of training during delivery?

(1) very comfortable

(2) comfortable

(3) not very comfortable

29. How often do you correctly anticipate questions from trainees?

(1) almost always

(2) sometimes

(3) seldom

(4) almost never

30. How comfortable do you feel telling trainees you do not know the answers to their questions?

(1) very comfortable

(2) comfortable

(3) not very comfortable

31. Overall, how comfortable do you feel using media equipment, such as VCRs, televisions, computers, projectors, and similar equipment?

(1) very comfortable

(2) comfortable

(3) not very comfortable

32. Overall, how comfortable do you feel demonstrating the use of safety equipment, such as harnesses, respirators, and similar equipment?

(1) very comfortable

(2) comfortable

(3) not very comfortable

33. In general, how good would you say you are at delivering safety training?

(1) very good

(2) good

(3) not very good

34. Do you have a means through which to evaluate the safety training you deliver?

(1) yes

(2) no

35. How often do you ask trainees to complete training evaluations?

(1) almost always

(2) sometimes

(3) seldom

(4) almost never

36. How often do you incorporate trainees' feedback into training?

(1) almost always

(2) sometimes

(3) seldom

(4) almost never

37. In general, how good would you say you are at evaluating safety training?

(1) very good

(2) good

(3) not very good

Research Question 3

What are the relationships between the specific demographic characteristics of safety trainers and accidents trainees experience?

Objective for Research Question 3

The objective for the second research question is to determine the relationships between selected specific individual demographic characteristics of safety trainers and accidents trainees experience?

Items for Research Question 3

1. For every 1,000 employees that you trained on safety-related topics over the last 12 months, regardless of the clock hours each employee received and the specific content of the training, how many employees were involved in a construction-related accident over that same 12-month period?

___ employees per 1,000 employees trained

Appendix C

Human Subjects Committee Approval

Office of the Vice President for Research
Tallahassee, Florida 32306-2763
(850) 644-8673 FAX (850) 644-4392

APPROVAL MEMORANDUM

Human Subjects Committee

Date: 2/10/2003

Herbert Barber
1829 Laurel Oak Dr.
Statesboro, GA 30461

Dept.: Educational Leadership & Policy Studies

From: David Quadagno, cha:pp/ph

Re: Use of Human Subjects in Research

Specific Demographic Characteristics of Safety Trainers in Large U.S. Construction Firms, the Challenges Safety Trainers Experience when Planning, Delivering, and Evaluating Safety Training Programs, and How Safety Trainers Meet These Challenges

The forms that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Secretary, the Chair, and two members of the Human Subjects Committee. Your project is determined to be exempt per 45 CFR § 46.101 (b) 2 and has been approved by an accelerated review process.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals, which may be required.

If the project has not been completed by 2/9/2004 you must request renewed approval for continuation of the project.

You are advised that any change in protocol in this project must be approved by resubmission of the project to the Committee for approval. Also, the principal investigator must promptly report, in writing, any unexpected problems causing risks to research subjects or others.

By copy of this memorandum, the chairman of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols of such investigations as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Protection from Research Risks. The Assurance Number is IRBOOOO0446.

Cc: Dr. Bill Snyder HSC No. 2003.037

Appendix D

Types of Construction Accidents

The review of literature revealed that there are several different types of accidents in the U.S. construction industry. The following types of accidents were revealed in the literature: a) falls, b) trenching, heavy equipment, and c) confined space entry.

Fall Accidents

To investigate fall accidents, Hinze and Russell (1995) examined fatalities that were reported to OSHA. Hinze and Russell (1995), and also Surude, Fosbroke, and Braddee (1995), determined that falls clearly are the dominant type of accidents in the U.S. construction industry, with an average fall distance of 46.8 feet. The most common types of falls Hinze and Russell (1995) found were 1) off roof, 2) collapse of scaffolding, 3) off scaffolding, 4) collapse of structure, 5) through the floor opening, 6) off ladder, 7) off structure, 8) through roof opening, 9) off edge of floor opening, and 10) off beam support. Hinze and Russell examined 508 deaths in their study regarding falls, and 68 percent of all falls were attributed to these 10 types of falls.

Personick (1996) further noted the types of falls found in 1994. The types of falls, along with the number of fatalities associated with each type of fall were from 1) roofs, 34; 2) scaffolding, 22; 3) ladders, 15; 4) structural steel; and 5) other areas, 22.

Cohen and Lin (1991) reported that the Bureau of Labor Statistics concluded that falls accounted for approximately 20 percent of all occupational accidents in 1985. OSHA (1999a) reported that there were 3,940 fatal occupational falls from 1992 through 1997, including all industries. More specifically, falls accounted for approximately 34 percent of all construction deaths in 1997 and approximately 33 percent of the construction deaths in 1998 (BLS, 1999b).

Prior to Hinze's 1995 study regarding falls, Cloe revealed in 1979 that of a study of 55 fatal falls from roofs investigated by OHSA, 49 percent were from the roof edge, 31 percent were through non-supportive materials, and 16 percent were through roof openings, as cited by Surunda, Fosbroke & Braddee (1995). Surunda, Fosbroke, and Braddee concluded that roofing workers or structural steel workers were the most likely individuals to be involved in fall accidents. To further note concerns associated with falls, the Bureau of Labor Statistics (1999b) noted the following fall types and associated fatalities for the years 1997 and 1998:

TABLE 21

Fatalities per Fall Type: Years 1997-1998

Type	1997	1998
Roofs	129	123
Scaffolds	63	84
Ladders	63	54
Structural Steel	38	36

Personick (1996) and Cohen and Lin (1991) examined specific types of falls, examining ladder fall accidents. While Personick concluded that falls from ladders constituted 20 percent of all disabling falls in the U.S. construction industry in 1993, Cohen concluded during an 18 month period that 60 percent of falls occurred while the employee was standing on the ladder, 26 percent of the falls occurred while the employee was descending the ladder, and 14 percent of the ladder falls occurred while the employee was ascending the ladder.

Cohen and Lin grouped the ladder fall accidents into ten categories and noted the frequencies in which each event occurred via percentages.

Table 22

Ladder Fall Accidents per Category

Category	Percentage
Over-reaching	19
Slips on rungs	14
Mis-steps on rungs	10
Failure of ladder structure	9
Being struck by or attempting to catch or avoid falling objects	8
Applying excessive force	7
Leaning step ladders	7
Transitioning onto or from ladders	6
Standing on top rung	6
Other miscellaneous ladder falls	14

In 1989 Wolf concluded that noncompliance with safety rules was a common reason for accidents (Bjornstig &

Johnson, 1992). Not surprising, Cohen and Lin (1991) found that several employees involved in the ladder fall accidents described above had received no safety training regarding the proper use of ladders. Arguably, it may make it nearly impossible for these employees to knowingly comply with safety rules that either did not exist or were unknown to the employees.

More recently, a review of data collected by the Bureau of Labor Statistics (see BLS, 2000; BLS, 1999b; BLS, 1998a; BLS, 1997a; BLS, 1996; and BLS, 1995) revealed that the percentage of employee deaths involving falls in the U.S. construction industry over the total number of employee deaths has averaged 33.8 percent over the last six years, including years 1995 to 2000. The percentage of deaths involving falls in the U.S. construction industry for the last six years is noted in the table below:

Table 23

Deaths involving Falls

Year	Deaths (%)
2000	32.4
1999	31.8
1998	32.7
1997	34.1
1996	39.7
1995	32.0

Trenching Accidents

In addition to falls, Hinze and Russell (1995) also found that trenching presents a serious safety concern in the U.S. construction industry. Trenching accidents occurred in relatively shallow trenches as a result of cave-ins, with 60 percent of the deaths involving trenches occurring in trench depths less than 11 feet. For the years 1985 through 1989, 79 percent of all trenching deaths occurred in trenches less than 15 feet and 38 percent of the trenching deaths occurred in trenches less than 10 feet. More recently, there were 26 deaths and 36 deaths resulting from trench cave-ins in 1997 and 1998, respectively (BLS, 1999b).

Heavy Equipment Accidents

Heavy equipment is also associated with a high percentage of fatalities in the construction industry (Hinze & Russell, 1995). Approximately 13 percent of all deaths in the construction industry involve industrial vehicles and equipment (Blackmon, 1995), with 75 percent of all fatalities due to employees being struck by heavy equipment such as trucks, cranes, graders, and scrapers. Texas alone had seven deaths relating to machinery between 1991 and 1993 (Richardson & Reyes, 1998).

Confined Space Entry Accidents

Along with accidents associated with falls, trenching, and equipment, the literature also suggests that confined

space entry is a safety concern in the U.S. construction industry that should be taken seriously. Deaths associated with the confined space entry may result from several causes, such as asphyxiation, inhalation of toxic gases or vapors, drowning, falling, or explosions (Manwaring & Conroy, 1990). Of the 55 confined space accidents that Manwaring & Conroy (1990) investigated, 88 deaths occurred. They grouped the types of confined space accidents with the percentage of deaths that occurred with each type.

Table 24

Deaths per Confined Space Type

Confined Space Type	Deaths (%)
Chemical storage tank	26
Sewer main/manhole	16
Water maintenance vault	15
Sewerage waste tank	9
Utility vault	9
Water tank	7
Sewage lift station	5
Grain bin/silo	5
Sewage digester	4
Machine pit	4

Of these 88 confined space deaths, 47 percent resulted from asphyxiation, 21 percent resulted from drowning, 19 percent resulted from toxic chemicals, 10 percent resulted from trauma, 2 percent resulted from electrocution, and one percent resulted from burns. As Smith and Roth (1991) noted, most of these accidents could have been prevented.

However, only 3 of the 88 workers, or just over 3 percent, had received confined space safety training (Manwaring & Conroy, 1990). Manwaring and Conroy further noted that needless accidents such as these underscore the importance of training and educating workers on safe work procedures.

Construction companies, large and small, perhaps should expect continued problems associated with safety unless training and education of employees occurs on a regular basis. Neither the public nor governmental agencies should expect compliance to safety regulations without having properly trained and educated construction employees.

Personal Protective Equipment

Issues associated with personal protection equipment were revealed during the literature review. Although specific studies addressing issues associated with personal protective equipment were not extensive, the information found is worth noting. For instance, Hinze and Harrison (1981) exposed information regarding personal protective equipment in a study regarding the nature of safety programs in large construction companies. Hinze found that employees of large construction companies were exposed to safety at the moment of hiring. Fifty-six percent of the large construction companies completing the survey gave formal safety training upon employees' initial employment, while 40 percent gave informal safety training upon employees' initial employment. Ninety-six percent of the construction companies responding to the survey also held regularly scheduled tool box safety meetings.

Hinze noted that all of the large construction companies responding to the 1981 study gave their employees hardhats, and 90 percent stated that employees were required to wear safety glasses. Not surprisingly, Hinze also found that the construction companies with better safety performances were those construction companies with more formal safety programs.

Appendix E

Cover Letters

date

Human Resources Manager
company
address
city, state zip

Dear Sir/Madam:

I am a Ph.D. student at Florida State University. As the last component in fulfilling the degree requirements, I am required to complete a research study, or dissertation, in my field. Prior to this study, I worked 16 years in construction industry working for large construction firms like yours. Therefore, my research centers upon safety training in large construction firms.

To complete this study and my degree, I would appreciate your help. If you are willing to help, please ask a safety trainer at your firm to participate. They simply need to complete the enclosed consent form and survey and return them to me. The total time necessary to participate will be about 15 to 25 minutes.

As one who works in the construction industry, I know that your time, and the time of your safety trainers, is limited. However, this study is an important step toward improving construction safety. Also, know that the information we receive from your safety trainers is confidential.

Again, I would really appreciate your helping me complete this study and my degree. Should you need to contact me, I can be reached at 912-489-1172.

Sincerely,

Herbert M. Barber, Jr.

date

Human Resources Manager
company
address
city, state zip

Dear Sir/Madam:

Recently we mailed you a letter asking you to help us reduce the number of accidents in the U.S. construction industry by participating in a study at Florida State University. As a component of this study, we asked you to complete a survey.

As you may remember, I am a Ph.D. student at Florida State University, and as the last component in fulfilling the degree requirements, I am required to complete a study in my field. Since my background and interests are in construction management, I chose to focus my research around safety training in large construction firms. I ultimately hope to begin laying the groundwork for reducing the number of deaths in the construction industry.

Having been a construction manager for 16 years, I know that you are very busy. However, if you would copy the documents herein and give them to the safety trainers within your firm and ask them to complete and return it, it would certainly be appreciated. The total time necessary to participate is only about 15 minutes. We would like to receive the completed surveys within one week if possible.

Again, I would really appreciate your helping me complete this study and my degree. Remember, in our industry, you can never tell…One day you may be asking me to do something for you. Should you need to contact me, I can be reached at 912-489-1172. Thank you for helping me.

Sincerely,

Herbert M. Barber, Jr.

date

1829 Laurel Oak Drive
Statesboro, GA 30461

xxx
xxx
xxx

Dear Human Resources Manager:

Recently we mailed you a letter asking you to help us reduce the number of accidents in the U.S. construction industry by having your company participate in a study at Florida State University.

As you may remember, I am a Ph.D. student at Florida State University, and as the last component in fulfilling the degree requirements, I am required to complete a study in my field. Since my background and interests are in construction management, I chose to focus my research around safety training in large construction firms.

Having been a construction manager for 16 years, I know that you are very busy. However, if you would give the documents herein to a safety trainer within your company and ask them to complete and return the survey, it would certainly be appreciated. The total time necessary to participate is only about 15 minutes. We would like to receive the completed surveys within one week if possible.

Again, I would really appreciate your helping me complete this study and my degree. Should you need to contact me, I can be reached at 912-489-1172. Thank you for helping me.

Sincerely,

Herbert M. Barber, Jr.

Appendix F

Interview Notes

Interviewee # 1

Less than $250M
H.S.
20 years+ const. exp
20 years+ safety exp
20 years+ delivery exp

Question 1

Discuss why you think safety trainers feel that corporate management more strongly supports safety training than general management and how you meet this challenge.

- Safety movement has grown over the years
- Financial reasons
- Humanitarian reasons
- They get into corporate management and forget what it takes to make safety happen
- Project managers are the profit and loss guys, working under deadlines and penalty clauses, etc. or incentive clauses
- PM – their job is to simply get the job done and safety gets in the way sometimes
- OSHA requirements
- 90% communication; 10% technical
- We establish what corporate management requires and get buy-in from project managers and make sure they completely understand requirements…when training will be delivered, how it adds value to success of project, etc.
- Always get feedback/evaluation back to project managers and discuss progress made

Question 2

Discuss why you think that safety trainers feel that they are better at planning and delivering safety training than they are at evaluating safety training, and how you meet this challenge.

- 1-2 hrs training will take 20-25 hrs of planning and development
- some/many people are very good at planning, but it is different for someone with no field experience trying to deliver training
- use cheat notes until you feel comfortable with material
- use train-the-trainer classes to help with evaluation issues, as well as planning and delivery
- have trainers attend training several times prior to them actually doing the training themselves
- we do not have experienced craft employees; jobs are being built by helpers
- you can't expect an employee to know what you know unless you train them
- you cannot expect an employee to work safely unless you tell them what safe work is

Interviewee # 2

$250-500M
B.S.
<5 years const. exp
<5 years safety exp.
20 years+ delivery exp.

Question 1

Discuss why you think safety trainers feel that corporate management more strongly supports safety training than general management and how you meet this challenge.

- Upper management says they really want this and they just mandate it
- The production side struggles to meet the safety requirements set by the corporate side
- The younger project managers just take it and do work safely
- Explain why we are mandating safety training for employees and reinforce necessity with examples
- Talk with employees about safety, why it is important on a regular basis
- It is easier for corporate to support safety. They just say, "Do it."

Question 2

Discuss why you think that safety trainers feel that they are better at planning and delivering safety training than they are at evaluating safety training, and how you meet this challenge.

- This is a given.
- Trainers often cannot evaluate as well as they plan. Often they cannot deliver as well as they plan either.
- It is easy to plan training but very difficult to deliver and evaluate training.
- We try to involve our people
- We do train-the-trainer programs
- Safety trickles down from superintendents to craft persons

- Deliver tool box talks weekly so we get buy in from superintendents and it trickles down to craft persons. They see their superintendents supporting training and follow suit.
- Trainers do not know how to evaluate better because they don’t know how…they must be trained and re-trained.

Interviewee # 3

$250-500M
H.S.
11-15 years const. exp
11-15 years safety exp.
11-15 years delivery exp.

Question 1

Discuss why you think safety trainers feel that corporate management more strongly supports safety training than general management and how you meet this challenge.

- Management as a whole supports safety
- Corporate managers must show the value to the training
- Project managers must meet deadlines and budget constraints and do so safely
- Corporate does not work under such strict deadlines and budget constraints
- Day to day battle to meet this challenge
- Looking for long term gains
- Discuss long term gains with project managers and superintendents on a regular basis

Question 2

Discuss why you think that safety trainers feel that they are better at planning and delivering safety training than they are at evaluating safety training, and how you meet this challenge.

- They select their senior field people to do training, but these guys do not feel comfortable standing in front of a large group and talking
- Do train-the-trainer
- Teach them adult learning styles
- They use the superintendents as content experts and have actual trainers help with the training component
- Trainers must be trained to do evaluation

Interviewee # 4

$250-500M
H.S.
20+ years const. exp
11-15 years safety exp.
11-15 years delivery exp.

Question 1

Discuss why you think safety trainers feel that corporate management more strongly supports safety training than general management and how you meet this challenge.

- Corporate just provides money
- They don't have to actually do the work
- Affect on bottom line - corporate attitude
- Different type of mentality; workers just expect accidents to occur
- Office just provides money
- Craft people must constantly be re-trained
- Has monthly meetings and brings up cases involving accidents and describes it in great detail, trying to create interest in safety

Question 2

Discuss why you think that safety trainers feel that they are better at planning and delivering safety training than they are at evaluating safety training, and how you meet this challenge.

- Most trainers are a little afraid of the workers or a little intimidated
- Safety training is a constant battle; so is quality control
- Train trainers before training
- Do little evaluation, I guess

Interviewee # 5

$250-500M
M.S.
6-10years const. exp
6-10 years safety exp.
6-10 years delivery exp.

Question 1

Discuss why you think safety trainers feel that corporate management more strongly supports safety training than general management and how you meet this challenge.

- Project managers and superintendents are reluctant about training
- Gets feedback from trainees
- Gets best time to do training and gives options
- Upper management support goes a long way
- If they see that corporate management views safety training as important, it helps

Question 2

Discuss why you think that safety trainers feel that they are better at planning and delivering safety training than they are at evaluating safety training, and how you meet this challenge.

- Are better at planning and delivery
- Question is how do we evaluate training tangibly
- Evaluation is a work in progress
- You could use pretests and post-tests
- Goes into the field to see if they are using the training
- Do accident investigations
- We may link accidents back to safety training

Interviewee # 6

$500-999M
B.S.
<5 years const. exp
<5 years safety exp.
<5 years delivery exp.

Question 1

Discuss why you think safety trainers feel that corporate management more strongly supports safety training than general management and how you meet this challenge.

- Upper management does not have to actually implement safety programs
- Safety has become a way of life
- Corporate management really cares and is supportive, but they are not involved in the day to day issues on the jobsite
- They hold meetings with all project managers…get to know sessions and stress the importance of safety

Question 2

Discuss why you think that safety trainers feel that they are better at planning and delivering safety training than they are at evaluating safety training, and how you meet this challenge.

- The toughest thing being a safety trainer is not talking down to construction workers
- Nobody cares how much you know until they know how much you care
- You have to develop relationships with your employees
- People listen no matter how good you are at delivering safety if they know you care and are trying to improve safety
- Train our trainers
- Involve our people in safety…allow them to play a part

Interviewee # 7

$500-999M
H.S.
11-15 years const. exp
11-15 years safety exp.
11-15 years delivery exp.

Question 1

Discuss why you think safety trainers feel that corporate management more strongly supports safety training than general management and how you meet this challenge.

- We find this to be true…we receive less support from our project managers and engineers
- Corporate is very hands-off
- Project managers have their own ideas as to how we do things
- Some managers just haven't bought into the idea of safety training yet
- Superintendents have some reluctance toward safety training
- Tries to receive feedback from superintendents
- Gives them options on scheduling training
- They have deadlines they are working against
- Upper management support goes a long way
- They see upper management supporting safety training and follow suit

Question 2

Discuss why you think that safety trainers feel that they are better at planning and delivering safety training than they are at evaluating safety training, and how you meet this challenge.

- I think this is true
- Evaluation is a challenge because the workforce is volatile
- Track our performance by reviewing accident rates
- Injuries do not always make their way back down to safety

- The key is to find out how to actually measure training effectiveness
- It is a work in progress
- We go to the field sometimes to see if they are applying their training
- We could give a post-test
- On an accident by accident basis, we may see ways to improve training

Interviewee # 8

>$1B
HS
20 years + const. exp
11-15 years safety exp
11-15 years delivery exp

Question 1

Discuss why you think safety trainers feel that corporate management more strongly supports safety training than general management and how you meet this challenge.

- Corporate management more clearly understands the value of safety training
- Project management has more to do - get the job done
- We've done a good job of educating corporate management and a poorer job educating project management
- We do a needs analysis regularly on all safety training
- Every training module has an education component to it that tells why we do safety training
- We (need to) link safety training to overall job performance
- We need to focus more on education and less on training

Question 2

Discuss why you think that safety trainers feel that they are better at planning and delivering safety training than they are at evaluating safety training, and how you meet this challenge.

- Trainers may be very good at planning and delivering
- Most trainers do not know or understand evaluation
- They do not understand how to actually develop new programs
- Evaluate the trainer, material, delivery method to improve training
- All employees do training evaluations

- We often go right into safety training without educating them first
- We do not put enough emphasis into evaluation; need to train trainers
- Many companies are too focused on actually delivering training and not on evaluation

Interviewee # 9

>$1B
MS
20 years + const. exp
20 years + safety exp
20 years + delivery exp

Question 1

Discuss why you think safety trainers feel that corporate management more strongly supports safety training than general management and how you meet this challenge.

- Has to do with their schedules
- Field persons work under pressure
- They talk with their trainees on a regular basis
- Get their opinions on their safety concerns
- It is a constant struggle to actually provide safety training
- Regularly discuss the importance of safety
- Sometimes use real accidents as examples to solicit more interest

Question 2

Discuss why you think that safety trainers feel that they are better at planning and delivering safety training than they are at evaluating safety training, and how you meet this challenge.

- This is probably true
- The preparation portion is time-consuming but not that difficult; evaluation is something we do seldom do to any extent
- We try to train our trainers on all areas
- Send them to seminars on safety
- Sometimes do training evaluations to evaluate the trainer and the content
- More experienced trainers may help the lesser experienced trainers
- Talk with our superintendents on the material covered
- Try to involve our people as much as possible
- Look at what kind of accidents occur

BIBLIOGRAPHY

Adams, E. (1999). Vocational teacher stress and technical education. Journal of Vocational and Technical Education, 16(1). Available: scholar.lib.vt.edu/ejournals/JTVE/v16n1/adams.html [2001, March 9].

Austin, J., Kessler, M. L., Riccobono, J. E., & Bailey, J. S. (1996). Using feedback and reinforcement to improve the performance and safety of a roofing crew. Journal of Organizational Behavior Management, 16(2), 49-75.

Baker, K., Olson, J. & Morosseau, D. (1994). Work practices, fatigue, and nuclear plant safety performance. Human Factors, 36(2), 244-257.

Belcher, G., McCaslin, N. & Bradrick, W. (1998). Postsecondary technical and occupational instructors' perceived use of student assessment information. Journal of Vocational Education Research, 23(1), 55-69.

Bernold, L. E. & Guler, N. (1993). Analysis of back injuries in construction. Journal of Construction Engineering and Management, 119(3), 607-621.

Blackmon, R. B. & Gramopadhye, A. K. (1995). Improving construction safety by providing positive feedback on backup alarms. Journal of Construction Engineering and Management, 121(2), 166-171.

Blitzer, R. (1988). Guiding people into the training profession. Training and Development Journal, 42(12), 65-67.

Bjornstig, U. & Johnson, J. (1992). Ladder injuries: mechanisms, injuries, and consequences. Journal of Safety Research, 23(1), 9-18.

Brewer, J. K. (1996). Everything you always wanted to know about statistics but didn't know how to ask (2nd ed.). Dubuques, I.O.: Kendall/Hunt Publishing Company.

Brown, J. M. & Davidson, L. J. (1991). Adapting vocational education teacher education training programs to work place changes. Journal of Studies in technical Careers, 13, 285-295.

Bureau of Labor Statistics (2000). Table A-1: Fatalities by industry and event or exposure, 2000. [Tabular data]. Bureau of Labor Statistics. Available: http://stats.bls.gov/iif/oshcfoi1.htm [2001, November 24].

Bureau of Labor Statistics (1999a). Census of fatal occupational injuries summary. Bureau of Labor Statistics. Available: http://stats.bls.gov/news.release/cfoi.nws.htm [1999, September 18].

Bureau of Labor Statistics (1999b). Table A-1: Fatal occupational injuries by industry and event or exposure, 1999. [Tabular data]. Bureau of Labor Statistics. Available: http://stats.bls.gov/iif/oshwc/cfoi/cftb0112.pdf [2001, November 11].

Bureau of Labor Statistics (1998a). Table A-1: Fatal occupational injuries by industry and event or exposure, 1997. [Tabular data]. Bureau of Labor Statistics. Available: http://stats.bls.gov/iif/oshwc/cfoi/cftb0112.pdf [2001, November 11].

Bureau of Labor Statistics (1998b). Table 3: Fatal occupational injuries and employment by industry, 1998. [Tabular data]. Bureau of Labor Statistics. Available: http://stats.bls.gov/news.release/cfoi.t03.htm [1999, September 18].

Bureau of Labor Statistics (1997a). Table A-1 Fatal occupational injuries by industry event of exposure, 1997. [Tabular data]. Bureau of Labor Statistics. Available: http//stats.bls.gov/iif/oshwc/cfoi/cftb0103.pdf [2001, November 24].

Bureau of Labor Statistics (1997b). Table 4: Employment and output by industry, 1886, 1996, and projected 2006. [Tabular data]. Bureau of Labor Statistics. Available: http://bls.gov/emp11:97.pdf [2001, December 2].

Bureau of Labor Statistics (1996a). New data highlight gravity of construction falls. Bureau of Labor Statistics. Available: http://stats.bls.gov/oshwclossm0001.pdf [1999, September 18].

Bureau of Labor Statistics (1996b). Table 1: Fatal occupational injuries by industry event or exposure, 1996. [Tabular data]. Bureau of Labor Statistics. Available: http://stats.bls.gov/iif/oshwc/cftb0082.pdf [2002, July 28].

Bureau of Labor Statistics (1995). Table 3: number, percent, and rate of fatal occupational injuries by injury, 1995. [Tabular data]. Bureau of labor Statistics. Available: http://stats.bls.gov/iif/oshwc/cftb0062.pdf [2002, July 28].

Bureau of Labor Statistics (1994). Table 3: number, percent, and rate of fatal occupational injuries by injury, 1994. [Tabular data]. Bureau of labor Statistics. Available: http://stats.bls.gov/iif/oshwc/cftb0057.pdf [2002, July 28].

Bureau of Labor Statistics (1993). Table A-1: Fatal occupational injuries by industry event or exposure, 1993. [Tabular data]. Bureau of labor Statistics. Available: http://stats.bls.gov/iif/oshwc/cftb0011.pdf [2002, July 28].

Caudron, S. (2000). Learning revives training. Workforce, 79, 34-37.

Chapman, T. (1993). Training 101: training challenges. Training & Development, 47, 13-15.

Clough, R. C. (1986). Construction contracting (5th ed.). New York, N.Y.: John Wiley & Sons, Inc.

Cohen, H. H. & Lin, L. (1991a). A retrospective case-control study of ladder fall accidents. Journal of Safety Research, 22(1), 21-30.

Cohen, H. H. & Lin, L. (1991b). A scenario analysis of ladder fall accidents. Journal of Safety Research, 22(1), 31-39.

Cohen, S. L. (1991). The challenge of training in the nineties. Training & Development, 45, 30-35.

Converse, J. M. & Presser, S. (1986). Survey questions: Handcrafting the standardized questionnaire. Thousand Oaks, C.A.: Sage Publications, Inc.

Crowley, L. G., Lutz, J. D. & Burleson, R. C. (1997). Functional illiteracy in construction industry. Journal of Construction Engineering and Management, 123(2), 162-170.

Culver, C., Florczak, G., Castell, R., Connolly, C. & Pelton, G. (1990). Analysis of construction fatalities - the OSHA data base 1985-1989. Occupational Safety and Health Administration.

Dahlgren, J. & Stone, J. R. (1990). Industry perceptions of industry-based training provided by technical colleges. Journal of Vocational and technical Education, 7, 46-56.

Dare, D. E. & Leach, J. A. (1997). Preparing tomorrow's HRD professionals: perceived relevance of the 1989 competency model. Journal of Vocational and Technical Education, 15(2). Available: htpp://scholar.lib.vt.edu/ejournals/JVTE/v15n2/dare.html [2001, March 9].

Davis, J. A. (1971). Elementary survey analysis. Englewood, N.J.: Prentice-Hall.

Dedobbeleer, N. & Beland, F. (1991). A safety climate measure for construction sites. Journal of Safety Research, 22(2), 97-103.

Dulaimi, M. F. & Langford, D. (1999). Job behavior of construction project managers determinants and assessment. Journal of Construction Engineering and Management, 125(4), 256-264.

Everett, J. G. (1999). Overexertion injuries in construction. Journal of Construction Engineering and Management, 125(2), 109-114.

Fister, S. (2000). Reinventing training at Rockwell Collins. Training, 37, 64-70.

Finch, C. R. & Crunkilton, J. R. (1993). Curriculum development in vocational and technical education (4th ed.). Needham Heights, M.A.: Allyn and Bacon.

Fitz-enz, J. (2000). The ROI of human capital: Measuring the economic value of employee performance. New York, N.Y.: American Management Association.

Folkman, J. (1998). Employee surveys that make a difference. Provo, U.T.: Executive Excellence Publishing.

Foster, P. N. (1999). Lessons from history: industrial arts/technology education as a case. Journal of Vocational and Technical Education, 13(2). Available: scholar.lib.vt.edu/ejournals/JTVE/v13n2/foster.html [2001, March 9]

Gans, G. M. (1981). The construction manager and safety. Journal of the Construction Division, 107(CO2), 219-226.

Garza, J. M., Hancher, D. E. & Decker, L. (1998). Analysis of safety indicators in construction. Journal of Construction Engineering and Management, 124(4), 312-314.

Gay, L. R. (1996). Educational research: Competencies for analysis and application (5th ed.). Upper Saddle River, N.J.: Prentice-Hall, Inc.

Glass, G. V. & Hopkins, K. D. (1996). Statistical methods in education and psychology (3rd ed.). Needham Heights, M.A.: Allyn & Bacon.

Gordon, H., Yocke, R. (1999). Relationship between personality characteristics and observable teaching effectiveness of selected beginning career and technical education teachers. Journal of Vocational and Technical Education, 16(1). Available: http://scholar.lib.vt.edu/ejournals/JTVE/v16n1/gordon.html [2001, March 9].

Gray, K. (1997). Seeking a "tie that binds": Integrating training & development/human resource development and teacher preparation. Journal of Industrial Teacher Education, 34(4), 80-86.

Greenan, J. P. (1986). Curriculum and assessment in generalizable skills instruction. The Journal for Vocational Special Needs Education, 9, 3-10.

Greenan, J. P., Wu, M., Mustapha, R. B. & Ncube, L. B. (1998). Attitudes and motivations of vocational teachers regarding program improvement. Journal of Industrial Teacher Education, 35(3). Available: http://scholar.lib.vt.edu/ejournals/JITE/v35n3/greenan.html [2001, May 14].

Gynn, A. K. (1999). Training and development in 1999: practices and challenges. Construction Specifier, 52, 37-41.

Hammer, W. (1989). Occupational safety management and engineering (4^{th} ed.). Englewood, N.J.: Prentice-Hall, Inc.

Hatcher, T. (1995). From apprentice to instructor: Work ethic in apprenticeship training. Journal of Industrial Teacher Education, 33(1), 24-25.

Hinze, J., Bren, D. C. & Piepho, N. (1995). Experience modification rating as measure of safety performance. Journal of Construction Engineering and Management, 121(4), 455-458.

Hinze, J. (1981). Human aspects of construction safety. Journal of the Construction Division, 107(CO1), 61-72.

Hinze, J. (1978). Turnover, new workers, and safety. Journal of the Construction Division, 104(CO4), 409-417.

Hinze, J., & Harrison, C. (1981). Safety programs in large construction firms. Journal of the Construction Division, 107(CO3), 445-467.

Hinze, J. & Pannullo, J. (1978). Safety: function of job control. Journal of the Construction Division, 104(CO2), 241-249.

Hinze, J. Pedersen, C. & Fredley, J. (1998). Identifying root causes of construction injuries. Journal of Construction Engineering and Management, 124(1), 67-71.

Hinze, J. & Rabound, P. (1988). Safety on large construction projects. Journal of Construction Engineering and Management, 114(2), 286-293.

Hinze, J. & Russell, D. B. (1995). Analysis of fatalities recorded by OSHA. Journal of Construction Engineering and Management, 121(2), 209-214.

Hinze, J. & Wiegand, F. (1992). Role of designers in construction worker safety. Journal of Construction Engineering and Management, 118(4), 677-684.

Hird, D. (2000). What makes a training program good. Training, 37, 48-52.

Holton, E. F. & Trott, J. W. (1996). Trends toward a closer integration of vocational education and human resource development. Journal of Vocational and Technical Education, 12(2). Available: http://scholar.lib.vt.edu/ejournals/JVTE/v12n2/Holton.html [2001, May 15].

Huck, Schuyler (2000). Reading statistics and research. New York, N.Y: Pearson Education, Inc.

Ichniowski, T. (2001). OSHA chief may try new tactics. Engineering News Record. Available: http://www/enr.com/news/enrbl_90301.asp [2001, December 1].

Jaselskis, E. J., Anderson, S. D. & Russell, J. S. (1996). Strategies for achieving excellence in construction safety performance. Journal of Construction Engineering and Management, 122(1), 61-70.

Kaeter, M. (1995). HRD degrees: Who needs them? Training, 32(11), 65-74.

Kartman, N. A. (1997). Integrating safety and health performance into construction CPM, 123(2), 121-126. Journal of Construction Engineering and Management.

Kaslow, A. (1998). Skills shortage threatens U.S. competitiveness. HR Focus, 75, 11-12.

Kibert, C. J. & Coble, R. J. (1995). Integrating safety and environmental regulation of construction industry. Journal of Construction Engineering and Management, 121(1), 95-99.

Kiser, K. (1999). Basic training for SMEs. Training, 36, 45.

Kiser, K. (1999). When those who 'do' teach. Training, 36, 42-48.

Kroemer, K., Kroemer, H. & Kroemer-Elbert, K. (1994). Ergonomics: How to design for ease & efficiency. Englewood Cliffs, N.J.: Prentice-Hall, Inc.

Kuchinke, K. P., brown, J. M., Anderson, H. & Hobson, J. (1998). Assessing training needs of manufacturing employees in rural Minnesota: a model and results. Journal of Industrial Teacher Education, 36(1). Available: http://scholar.lib.vt.edu/ejournals/JITE/v36n1/kuchinke.html [2000, August 24].

Laufer, A. & Ledbetter, W. B. (1986). Assessment of safety performance measures at construction sites. Journal of Construction Engineering and Management, 112(4), 530-543.

Leach, J. A. & Sandall, D. L. (1995). Required business skills for training professionals. Journal of Industrial Teacher Education, 32(4). Available: http://scholar.lib/ejournals/JITE/v32n4/leach.html [2001, May 15].

Leach, J. A. (1999). Distinguishing characteristics among exemplary trainers in business and industry. Journal of Vocational and Technical Education, 12(2). Available: http://scholar.lib.vt.edu/ejournals/JVTE/v12n2/leach.html [2001, March 9].

Leedy, P. D. (1989). Practical research: Planning and design (5th ed.). New York, N.Y.: MacMillian Publishing Company.

Mager, R. F. (1997). Measuring instructional results (3rd ed.). Atlanta, G.A.: The Center for Effective Performance, Inc.

Mager, R. F. & Pipe, P. (1997). Analyzing performance problems (3rd ed.). Atlanta, G.A.: The Center for Effective Performance, Inc.

Manwaring, J. C. & Conroy, C. (1990). Occupational confined space-related fatalities: surveillance and prevention. Journal of Safety Research, 21(4), 157-164.

Marquardt, M. J., King, S. B. & Koon, E. (2001). International comparisons: Report 2001: An annual accounting of worldwide patterns in employer-provided training. American Society of Training & Development.

Martin, G. L. (1988). Training programs for engineering consulting firms. Journal of Construction Engineering and Management, 114(1), 121-132.

McCullough, R. (1987). Professional development (3rd ed.). New York, NY: McGraw-Hill.

McLagan, P. A. (1983). Models for excellence: the conclusions and recommendations of the ASTD training and development competency study. Washington, D.C.: American Society for Training and Development.

McMillan, J. H. & Schumacher, S. (1997). Research in education: A conceptual introduction (4th ed.). New York, N.Y.: Addison Wesley Longman, Inc.

Miller, W. R. (1990). Instructors and their jobs. Homewood, I.L.: American Technical Publishers, Inc.

Mills, L. (1999). Jump start your safety training: 10 ways to drive your message home. Safety & Health, 159, 46-50.

Neubert, D. A. (1990). Vocational assessment: Effective intervention for meeting the vocational needs of rural youth with special needs. The Journal for Vocational Special Needs Education, 12(2), 17-22.

Occupational Safety and Health Administration. (1999a). Fatal occupational injuries by state and event or exposure, 1996. [Tabular data; table 1]. Occupational Health and Safety Administration. Available: http://www.osha.gov/oshstats/bls/pdfs/supp961.pdf [1999, September 18].

Occupational Safety and Health Administration. (1999b). Fatal occupational injuries by event or exposure, 1992-1997. [Spread sheet]. Occupational Health and Safety Administration. Available: http://www.osha.gov/osstats/fataltbl.html [1999, July 28].

Occupational Safety and Health Administration. (1998). OSHA proposes steel erection standard that would save 26 lives, $40 million a year. Occupational Health and Safety Administration. Available: http://www.osha.gov/media/oshnews/aug98/steel.html [1998, June 6].

Occupational Safety and Health Administration. (1997a). Fatal occupational injuries by event or exposure, 1992-1996. [Spread sheet]. Occupational Health and Safety Administration. Available: http://www.osha.gov/oshstats/bls/fatalbl.html [1998, May 30].

Occupational Safety and Health Administration. (1997b). National census of fatal occupational injuries, 1996. Occupational Health and Safety Administration. Available: http://www.osha.gov/oshstats/cfoi.nws.html [1999, September 18].

Occupational Safety and Health Administration. (1996a). Fatal occupational injuries by state and event or exposure, 1996. [Tabular data; table 5]. Occupational Health and Safety Administration. Available: http://www.osha.gov/oshstats/cfoi.t05.html [1999, September 18].

Occupational Safety and Health Administration. (1996b). Fatal occupational injuries by state and event or exposure, 1996. [Tabular data; table 3]. Occupational Health and Safety Administration. Available: http://www.osha.gov/oshstats/cfoi.t05.html [1999, September 18].

Olson, S. J. (1994). Competencies of two-year college technical instructors and technical trainers: Similarities and differences. Journal of Industrial Teacher Education, 32(1). Available: http://scholar.lib.vt.edu/ejournals/JITE/v32n1/olson.html [2001, May 15].

Oosterhof, A. (1999). Developing and using classroom assessments (2nd ed.). Upper Saddle River, N.J.: Prentice-Hall, Inc.

Overman, S. (1999). Skilled labor: gearing up for tomorrow's workforce. HR Focus, 76, 13-15.

Patten, M. L. (1998). Questionnaire research: A practical guide. Los Angeles, C.A.: Pyrczak Publishing.

Personick, M. E. (1996). New data highlight severity of construction falls. Compensation and Working Conditions Online. Bureau of Labor Statistics. Available: http:stats.bls.gov/opub/cwc/1996/fall/brief3.htm [1999, September 18].

Petrini, C. M. (1993). Seven steps for back to the basics training, nineties-style. Training & Development, 47, 15-17.

Richardson, S. & Reyes, R. (1993). Fatal work injuries in construction in Texas, 1991-1993. Census of Fatal Occupational Injuries. Available: htpp://stats.bls.gov/oshwc/cfar0012.pdf [1999, September 18].

Roth, R. (1981). Trainers in business & industry; implications for colleges of education. Journal of Teacher Education, 32, 33-36.

Sleezer, C. (1992). Needs analysis: Perspectives from the literature. Performance Quarterly, 5(2), 34-46.

Smith, G. R. & Roth, R. D. (1991). Safety programs and the construction manager. Journal of Construction Engineering and Management, 117(2), 360-371.

Smith, S. L. (1993). Safety training for a salad bowl society. Occupational Hazards, 53, 36-40.

Streff, F. M., Kalsher, M. J. & Geller, E. S. (1993). Developing efficient workplace safety programs: observations of response covariation. Journal of Organizational Behavior Management, 13(2), 3-15.

Suazo, G. A. & Jaselskis, E. J. (1993). Comparison of construction safety codes in United States and Honduras. Journal of Construction Engineering and Management, 119(3), 560-572.

Suruda, A., Fosbroke, D. & Braddee, R. (1995). Fatal work-related falls from roofs. Journal of Safety Research, 26(1), 1-8.

Tate, R. (1998). An introduction to modeling outcomes in the behavioral and social sciences (2^{nd} ed.). Edina, M.I.: Burgess International Group, Inc.

Swanson, R. (1996). In praise of the dependent variable. Human Resource Development Quarterly, 7(3), 203-207.

Swanson, R. & Falkman, S. (1997). Training delivery problems and solutions: Identification of novice traiers problems and expert trainer solutions. Human Resource Development Quarterly, 8, 305-314.

Van Buren, M. E. (2001). State of the industry report 2001. American Society of Training & Development.

Weischadle, D. (1984). Trainers in business and industry: Implecations for colleges of education. Journal of Teacher Education, 32(2), 33-36.

Wilson, J. M. & Koehn, E. (2000). Safety management: problems encountered and recommended solutions. Journal of Construction Engineering and Management, 126(1), 77-79.

Winston, S. (2001). Steel erection rule is first plan under negotiated rulemaking. Engineering News Record. Available: http://www/enr.com/news12901b.asp [2001, December 1].

Zemke, R. & Senge, P. (1999). Why organizations still aren't learning. Training, 36, 40-49.

Zielinski, D. (2000). Training careers in the 21st century. Training, 37, 26-38.

BIOGRAPHICAL SKETCH

Herbert Marion Barber, Jr. was born in Blackshear, Georgia, June 10, 1965. He attended schools in Pierce County, Georgia, graduating from Pierce County High School in 1983. In 1983, he began working his way through college, graduating in 1989 with a B.S. in civil engineering technology from Georgia Southern College. In 1997, he earned an M.T. in industrial management from Georgia Southern University, and in 1999, he completed an Ed.S. in vocational education from Florida State University. The Ph.D. in vocational education at Florida State University will complete his formal educational endeavors.

Barber's experience in the construction industry has been in the area of project engineering and management, working primarily on large industrial projects. He has had the opportunity of supervising hundreds of employees and managing several million dollars worth of construction over the past 16 years. He has been directly involved with over $2 billion worth of construction. He also has served as a visiting professor of construction management at Georgia Southern University and regularly serves as an expert witness for civil litigation cases.

Currently, his interests are in the area of performance improvement, specifically as it relates to the role that human capital plays in the overall performance of

construction organizations. Upon completion of the Ph.D., he plans to continue his career in construction management.