1-1-2000

University Baccalaureate curriculum analysis for safety and health in the United States of America (USA) toward a model University Baccalaureate curriculum

Margie L. Kolbe-Mims
Edith Cowan University

University Baccalaureate Curriculum Analysis for Safety and Health In The United States of America (USA) Toward A Model University Baccalaureate Curriculum

by

Margie L. Kolbe-Mims

A Thesis Submitted in Partial Fulfillment of the

Requirements for the Award of

Doctor of Philosophy (Occupational Health and Safety)

At the Faculty of Communication, Health and Science Edith Cowan University

Perth, Western Australia, Joondalup Campus

Date of Submission: 2 October, 2000

USE OF THESIS

ABSTRACT

University Baccalaureate Curriculum Analysis for Safety and Health
In The United States of America (USA)
Toward A Model University Baccalaureate Curriculum

The goal of this research was to determine a model safety and health baccalaureate curriculum. A secondary target was to ascertain if safety and health practitioners and safety and health educators would concur on course offerings.

To simplify this study effort, a search of literature was conducted on the Occupational Safety and Health field. There were no in-depth studies of this type for such a general population; therefore no instrument was available for this study. The perusal of literature indicated that most such studies had been conducted using a more specific target group of subjects. That is, faculties or former students of a particular university, one was completed on only certified safety professionals (CSP), or members of the National Safety Managers Society (NSMS) and the like. This study included most geographical areas of the United States of America and thus faculties and former students from many universities.

First, it was necessary to determine the competency required for a successful career in Occupational Safety and Health. Second, devise a survey instrument to collect the competency information to function well in this area and essential to the development of a curricula questionnaire.

Directories used to select expert subjects to serve as judges for this research included the American Society of Safety Engineers (ASSE), American Industrial

Hygiene Association (AIHA), National Safety Council, Business and Industry Division (NSC/B&I), and the World Safety Organization (WSO).

Since the Delphi technique was being used, a pilot study was employed to collect information from a selected group of practitioners and educators. This information served as the basis for creating a survey instrument that was mailed to 489 health and safety practitioners and educators. A total of 355 or 72 per cent of the surveys were returned. Eighteen surveys were undelivered for various reasons, with a total of 337 usable surveys, of this population list responding to the survey ranking the importance of the courses.

The data from the returned surveys were analyzed by several different methods suggesting:

(1) There was a preference for certain core, elective and preparatory courses.

(2) There were some significant differences of the responding safety practitioners and safety educators.

(3) There was no evidence of non-respondent bias for the total group; however, considering only the safety practitioners there was some evidence of regional bias.

These analyses facilitated the recommendations that certain course offerings be required for:

(1) a core curricula,

(2) particular preparatory courses and

(3) a choice from several electives course listings.

DECLARATION

I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any institution of higher education; and that to the best of my knowledge and belief it does not contain any material previously written by another person except where due reference is made in the text.

DEDICATION

This thesis is dedicated to my parents, the late Albert and Loretta Kolbe, who taught me the essential values for development of an ethical, logical, sensible human with viewpoints to understand life as a gift and to use it to the best of my ability.

To the inspiration, encouragement and unwavering support of my sister, Ardis Kolbe LaValley, who constantly checked the status of my research and showed a genuine interest in my educational advancement.

And most of all, the entire thesis is dedicated to my husband and friend Albert "Al" Mims, who has inspired me to grow and achieve what I wanted out of life. Always providing encouragement, patience, direction and constant support.

ACKNOWLEDGEMENTS

The author wishes to express appreciation to Supervisors Dr. Milos Nedved and Mrs. Janis Mussett R.N. O.H.S. M.P.H., for their thoughtful guidance. Who so graciously helped answer my questions and directed me to efficiently progress with this thesis.

I would like to thank Dr. Steve Friedman, University of Wisconsin-Whitewater, USA who directed me on the design of the initial survey format.

I wish to express special gratitude to Dr. Robert Clasen from the University of Wisconsin-Madison USA, for his suggestions during the course of identification and development, professional guidance, constant encouragement, and unselfish gift of time. His professional expertise and help in critiquing allowed me to continue with a project of this magnitude.

Many thanks go to Dr. Jerome Witherill, from the University of Wisconsin-Whitewater USA for his constructive critiquing of the thesis. His professional expertise and help gave me an open view to the worthiness of this thesis.

I would also like to thank Dr. Roger Brown, from the University of Wisconsin-Madison Research USA, for his statistical analysis help and encouragement during the analysis phase of this thesis.

TABLE OF CONTENTS

Page

LIST OF TABLES

Table *Page*

LIST OF FIGURES

LIST OF Equations

Equation *Page*

CHAPTER ONE

INTRODUCTION

Safety, being a multidisciplinary subject, presents a major problem for planners of a university safety and health curriculum. A dilemma exists since there is a variety of seemingly appropriate courses to provide the knowledge and skill required to successfully function as a safety and health practitioner. An essential part of devising a safety and health curriculum is to determine the activities of a safety professional. At first glance this would appear to be an easy task; yet, another quandary. The role of a safety professional is dynamic. It is not as simple as locating a universal job description and using that information. The characteristics of the position changes with time, as well as with size, expectations, culture and purpose of the organization.

Job descriptions, for safety professionals, do share some common features. A composite of several major enterprises indicate that all expected the safety practitioner to:

- audit safety and health standards for deviations
- perform safety and health inspections or surveys
- assist with writing safety practices
- recommend safety devices and personal protective equipment
- investigate accidents
- assist with safety training
- promotion of the safety program
- assist with workers' compensation, and

- maintain a safety and health record keeping system.

Most of these functions have been in use for many years and are still appropriate today. According to the Professional Safety Journal of ASSE (September 2000) "The changes-moving from a subject-based to a task-based structure-are based on changes in professional safety practice, which were revealed by an extensive validation study conducted by BCSP."

Background of the Study

For many years the USA safety and health operation was, more or less helter-skelter. Safety goals were disorganized resulting in an enigmatic safety function. This was especially true for the education and training process of the safety profession. Prior to the 1970s, on the whole, safety was learned with on-the-job training. It is not coincidental, that this change came about in the 1970s, since this was the period for the enactment of the Occupational Safety and Health Act (OSHAct). The passage of the OSHAct abated some of the confusion as it gave some direction and purpose for safety activities.

Over one-quarter of a century ago the modern day safety and health curriculum for a baccalaureate degree was founded in the United States of America (USA). The National Institute of Occupational Safety and Health (NIOSH) funded a grant to determine the type of knowledge and skills required for serving the profession. Texas A&M University, the American Society of Safety Engineers (ASSE) and NIOSH cooperated in this research endeavor to discover the information most appropriate for USA safety practitioners. This effort was performed during the 1970s time period and subsequently a curriculum was recommended.

According to a nationwide survey of the Occupational Safety and Health Workforce, (1978) :

> The Occupational Safety and Health Act of 1970 (Public Law 91-596 declares it to be Congress' purpose and policy:
>
> ...to assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources ....by providing for training programs to increase the number and competence of personnel engaged in the field of occupational safety and health....
>
> Section 21 (a) of the Act further states that:
>
> The Secretary...shall conduct, directly or by grants and contracts (1) education programs to provide an adequate supply of qualified personnel to carry out the purpose of this Act .... (OSHAct, p.1)

Following this major mandate of section 21 (a) of the Act many USA colleges and universities initiated degree programs in occupational safety and health. Previous to OSHAct in 1970 most USA schools only offered degrees with a traffic safety emphasis. Prior to 1970 many safety practitioners were recruited from the ranks mainly from maintenance personnel. A large number of these promoted practitioners had been implementing guarding techniques to prevent pinch-point injuries. Another major group came from the engineering profession. They, too, had been instrumental in machine guarding as well as other focal points of safety, for example chemical, electrical, or mechanical installations and operations. Yet another group that did safety inspections came from production personnel. These production people learned some safety and progressed into the safety position. Organizations that had occupational safety and health nurses on site were also used to do some of the safety work, such as accident reporting, accident investigation and workers' compensation.

Significance of the Study

Early safety practitioners, taking into account all possible consequences, performed rather well despite the fact they had no formal safety education. Main stated (1999, p.50) "currently, at major USA universities, less than twenty percent (20%) of engineering students take a safety course," although a number of students elect a safety profession. Also, a few USA organizations still recruit safety personnel from the better technicians and operators among the ranks. Therefore, lacking any formal safety education, it was and is difficult for them to perform well in many of the functions of a safety practitioner. For example, communications were and are hindered since very little familiarity with the safety terminology. During those premature year's safety was considered, in many organizations, a "dead-end" position. Existence in safety was considered non-promotable because it was so specialized. Thus the safety profession was handicapped in their recruiting efforts for strong personnel. Early safety practitioners did not understand the importance of the bottom line. In fact, profit and loss was almost like a foreign language to many of these practitioners. Consequently, they were unable to persuade top management to adequately fund safety programs.

A sound occupational safety and health performance improves the quality of life. Employees are able to do the recreational activities away from the job and with family members. These are advantages to employees since they are healthier and able to participate more fully in life's activities. When an employee suffers an injury they are unable to participate in activities and events such as golf, running or riding a bike. The profit margin of the employer is enhanced by a healthier well-trained employee's performance. The public benefits from a less expensive better quality product. It may be inferred that a strong and viable occupational safety and health program appears to be desirable. In order to achieve an occupational safety and health program it is essential to provide the structure for accomplishing the goal. A well-planned university and college safety and health curriculum would take a major step in providing a resource for the safety function.

Passage of the OSHAct created rapid and often uncontrolled growth of safety programs throughout the country. According to Montgomery (1983), Orn(1982) suggested "areas of concern to be addressed were academic curriculum, and the presentation of courses displayed a wide variety of approaches from school to school. Course content may not be alike even though course titles are the same." Orn goes on to state the lack of laboratory equipment and materials limit the ability to present important information, as well as the demonstration of monitoring devices.

Montgomery (1983) goes on to say Specht and Graves (1981) state industry desires a safety practitioner to have in-depth-practical experience moving directly into an industrial setting and be immediately functional. Academia being limited with the amount of credit hours can not always meet these requirements, and feels a reevaluation of the academia structure is required from time to time (p 3). Industry and academia alike realize products and services change therefore a need exists for reevaluation of the safety field and a practitioner's position.

Examination of the safety curriculum indicates that the general safety practitioner should be able to perform:

- Inspecting and appraising unsafe conditions and practices
- Establishment of hazard control policies
- Initiating, managing and counseling others on hazard control methods.
- Measurement and auditing of the safety performance (Laing 1992, p.80).

The modern occupational safety and health field has provided colleges and universities with an opportunity for growth. Due to safety and health legislation, technology, changing cultures and the like, more safety practitioners are required. Also, today's safety practitioner needs an organized knowledge base, since the information base is constantly undergoing changes and becoming more complex. The quantity and quality of information required for a successful safety practice furnishes a body of knowledge adaptable to a college curriculum. This curriculum is dynamic and requires evaluation periodically.

Purpose of the Study

The objective of this study is to ascertain if a model safety and heath curriculum standard, in the USA, is achievable. These curriculum standards are to define the minimum academic requirements for persons entering the safety profession. A second objective is to determine if the educators and practitioners agree on the choice of a curriculum.

Definition of Terms

The following terms are identified in order to give a better understanding of the purposes and procedures of this study.

Box-and-Whisker Plot: A diagram that summarizes data using the median, the upper and lower quartiles, and the extreme values. A box is drawn around the quartile value and the whiskers extend from each quartile to the extreme data points.

Critical Incidents: Method of gathering information from study participants of specific incidents and behaviors related to the matter under investigation.

Curriculum: All of the courses, collectively offered in a school or college, qualifications in a major field of study.

Delphi Technique: A panel of experts is asked to complete a series of questionnaires. The information solicited in the instruments typically are opinions, predictions or judgments of a specific topic.

Educator: A person whose work is to educate others. A person referred to in this study that teaches safety and health at a college or university.

Knowledge: Understanding, judgement, information, and wisdom.

Likert Scale: Summated rating scale, respondents are asked to indicate their degree of agreement or disagreement.

Non-Technical: Having to do with the administration of a function. For example managing, directing or supervising.

Professional Core Courses: Develop the basic knowledge and skills of a safety professional, in this study occupational safety and health.

Quartile: Quarters of the data when they are arranged in order.

RIDIT Analysis: Relative to an Identified Distribution. A technique used for treating ordinal data.

Safety Engineer: Individuals who through education, licensing and or experience, apply scientific principles to the control of environments for the purpose of protecting people, property and the environment.

Safety Manager: The individual responsible for establishing and maintaining the safety organization and its activities in an enterprise.

Safety Practitioner: Practitioners are concerned with preventing needless deaths and injuries of workers. A person who practices

	a profession, in this study of occupational safety and health.
<u>SAS:</u>	Statistical Analysis System. Computerized statistical package for analyzing data.
<u>Scope:</u>	Range of perception or understanding.
<u>Skill:</u>	Proficiency resulting from training, practice etcetera.
<u>Technical:</u>	Having to do with the practical, industrial, or mechanical arts or the applied sciences for example engineering or technicians.

Assumptions

For the purpose of this study it was assumed that:

1. The sample was representative of the population of educators teaching in the occupational health and safety field.
2. The sample was representative of the population of practitioners working in the occupational health and safety field.
3. Occupational health and safety is synonymous with occupational safety and health.

Research Questions

The following research questions were tested by this study:

1. Will a model safety and health baccalaureate curriculum emerge?
2. Will safety educators and safety practitioners agree on course offerings?

CHAPTER TWO

REVIEW OF LITERATURE

Background

At the beginning of the twentieth century, in the USA, the occupational accident and illness record was horrific. As mass production developed "new methods of organizing work and new industries appeared quickly, exacting a grim toll on workers' health and safety" (Laing,1992 p.22). There were a shocking number of injuries, illnesses, and deaths annually caused by the workplace conditions and activities. Such a situation was unacceptable to thinking citizenry and thus politically unacceptable.

As a result of this state of affairs, efforts were initiated to correct this predicament. One of the early solutions offered, for this unacceptable problem, was legislation in the form of workers' compensation. The first effective workers' compensation law was enacted by congress for federal employees and served as a precedent for state laws to follow. However it was not until 1911, that the first effective state workers' compensation was enacted (Laing, 1992, p.6).

Next non-profit organizations, such as National Safety Council (NSC) and the American Society of Safety Engineers (ASSE), joined this worthy crusade to improve workplace safety. The work by non-profit organizations was vital, then and now, in achieving and continually updating occupational safety and health goals. Most of the safety experts, past and present, belong to such organizations. Through publications of these experts, still referenced today, improvements in occupational safety and health efforts continue.

The primary objective of this research is to determine if a model safety and health curriculum could be achieved. In order to accomplish this purpose it is important to ascertain the knowledge and skills necessary to prepare for performance by practitioners in this area. The functions of this position would certainly be useful in deciding the competency required for a solid performance. In fact, to solve this curriculum quandary it is essential to be aware of the type of information required to successfully practice as a safety and health practitioner.

Currently in the USA, there is a dilemma among safety and health educators regarding the types of courses to be offered in a safety and health curriculum. In most respects the curriculum, being offered, was initiated approximately a quarter of a century ago and is primarily technical and of a prescriptive nature. Much of the present day faculties are of the opinion that it is beyond the time for a revision.

Functions and Curricula Requirements

To be able to develop an occupational safety and health curriculum, functions of the safety position are essential. A variety of different viewpoints exist, by safety experts, on the functions of safety personnel. The following describes a representative sample of these safety experts' outlook, at different time periods.

From 1920 to 1970. Throughout the last three-quarters of the twentieth century leading safety authorities have supported each other, to a major degree, on the basic functions of a safety practitioner. They appear to concur that these activities include:

- ✓ Inspecting and appraising unsafe conditions and practices.
- ✓ Establishment of hazard control policies.
- ✓ Initiating, managing, and counseling others on hazard control methods.

✓ Measurement and auditing of the safety performance (Laing, p.80)

In the early part of the twentieth century, at least during the first quarter, much of the activities of occupational safety personnel was focused on unsafe conditions As described by one safety expert of that period, safety practitioners should possess adequate mechanical and work process information to assist in working with design and facility engineers. It was further recommended that an acquaintance of various other engineering disciplines would be beneficial. However, in a surprising departure from the technical field, it was also suggested that familiarity in legal aspects, statistics, human anatomy, psychology, training techniques, workers' compensation and communication would be helpful (Lange,1922).

The theme of unsafe conditions was continued in an accident prevention book first published in 1931. Heinrich, a leading safety authority, indicated that the duties of the safety practitioner (safety engineer) included regular inspections of the workplace for unsafe conditions and unsafe practices of employees. It was further suggested that the safety engineer be expected to make recommendations for improvement of safety, to participate in safety training of all employees and to be a consultant to higher executives (Heinrich, 1950, pp. 45-46). Heinrich established many of the early safety standards in the USA and is recognized as the "father of occupational safety."

The functions of the safety practitioner, known by several other names, involve many activities. Specifically and succinctly stated it entails: "investigation, research, and analysis of accident and health problem; invention and design of physical means of preventing accidents and occupational illnesses; and the development and direction of educational programs designed to create and maintain safety awareness at every level of the organization" (DeReamer, 1958, pp.320-328). It was, also, suggested that the safety function, many times, included loss control or a potpourri of other activities.

The definition of the safety position may vary, as it is perceived by diverse interest groups. Thus the safety function will change with the perception of the position. An essential part of the safety engineering role "is the reduction of losses resulting from accidents and industrial diseases" of the working environment. This is a sound; however, limited definition. The major skills, stated, in general terms, to perform the duties, as described for this position, are "analysis, interpretation, and communications" (Rockwell, 1962, pp.16-19).

During the 1960s a project was initiated, with the approval and support of the ASSE, to enhance the image of the safety profession. The successful mission of this undertaking was divided into three (3) parts:

- First, describe the scope and functions of the safety profession.
- Second, devise a formal educational system for the preparation of safety personnel.
- Third, develop a certification program (Tarrants, 1963).

The first and third goals were accomplished in the 1960s; however the second goal was not completed until the 1980s. The end result of the first goal was an explicit description of the scope and functions of the safety practitioner, which was first completed in 1963 and revised in 1994. The end product of the second goal was a suggested curriculum for the education of a safety practitioner. This task is continually under going revision and is at the center of constant controversy. The nature of the safety position continues to be deemed engineering by some and managerial by others. Consequently it is difficult for educators to focus on a standard curricula. The completion of the third goal resulted in an accredited accreditation process. It too, is controversial and under constant revision to keep abreast of the times. The accreditation process has been criticized as having too many engineering type courses required for a school to be accredited. Recently the accreditation process has gone through a review and expects to make changes in 2001, moving from a "subject-based" to a "task-based" structure (Trebswether p.3).

From 1970 to 1990. Prior to implementation of the Occupational Safety and Health Act (OSHAct 1970) safety goals were disorganized resulting in an enigmatic safety function. The passage of the OSHAct abated some of the confusion as it gave some direction and purpose for safety activities. This also gave occupational safety and health curricula developers direction and requirements of what the industry needed.

> The Occupational Safety and Health Act of 1970 (Public Law 91-956 declares it to be Congress' Purpose and policy: ...to assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources...by providing for training programs to increase the number and competence of personnel engaged in the field of occupational safety and health...

Section 21(a) of the Act further states that:

> The Secretary....shall conduct, directly or by grants and contracts education programs to provide an adequate supply of qualified personnel to carry out the purpose of this Act... (OSHAct, 1970).

Marcum (1973) suggested a suitable list of subject matter for an academic safety and health discipline: "safety philosophy; accident phenomena; safety practices; protective considerations; program elements; safety appraisal; and supporting fields such as behavioral and engineering science as well as medical and public health relationships" (Widner, 1973, p.201). Such a general listing certainly provides the needed foundation for safety subject matter organization. The body of knowledge and skills is both extensive and varied. The listing needs to be broken down into specifics allowing safety educators and safety students to determine needs and areas of interest.

A research project was conducted in an effort to determine the type of material to be included in a safety curriculum for American higher education. The participants for this study were selected from the National Safety Management Society (NSMS) membership. One chief finding was that "safety practitioners would progressively utilize more and more communications skills and sophisticated managerial techniques" (Ferry, 1973, pp.49-89). These findings could be suspect since the NSMS would be predisposed toward a management solution.

Much of the discord, among safety personnel, is disagreement or absence of harmony that is the result of two different philosophies, technical and managerial. The center of controversy is primarily among safety experts that believe technical knowledge is more important and another group that thinks management is the best source of knowledge to practice safety. The technical group prefers to refer to the safety practitioner as safety engineer while the management group prefers the title safety manager. "The safety engineer is concerned with the world of hardware, mathematics, and the physical sciences whereas the safety manager is concerned with the science of getting things done through others" (LeClerg, 1975, p.1-2). Technical and managerial concerns are decisions the developers of curricula, as well as safety students are encountering.

According to another safety expert Margolis (1975) organizational guidelines for promoting and encouraging a sound safety performance is "concerned with principles of management and organization, which are the bases for a safe working environment." There are many examples of engineering solutions to accident problems that failed because they did not consider the individual. Engineers developed safety measures on equipment such as two hand punch press buttons and failed to appreciate factors of whether an operator would seek to sabotage it. All these factors are human elements, the psychological factor in accident causation. This addressed the need for curricula developers to consider management and the behavioral sciences (pp.3-39). Margolis' approach further broadens the curriculum issue on what courses are needed.

According to Brown (1976) "Although specialized functions must be performed by staff personnel the ultimate authority and responsibility for safety of the work force must rest with their immediate supervisors" (p.33). For the safety function to be effective, it is necessary to have clear lines of responsibility and authority between staff and line personnel. Safety will not be effective if organized as a separate function. In summarizing a second management strategy, Brown points out, "staff safety personnel are responsible for identifying hazards with respect to standards, and for implementing special countermeasures beyond the normal operational countermeasures required by day-to-day operations" (p.34). Brown goes on to say that communication and budgeting skills are essential for safety personnel.

Helberg discussing "Management Involvement For Safety Engineers," first appeared in the American Society of Safety Engineers Professional Journal in July 1968. The editor of *Directions In Safety* believed the message contained in this discussion was relevant in 1976. Helberg mentions three safety positions and referred to all three as safety engineers. The inference from this article is although entitled safety engineer, and certainly requiring engineering knowledge, it is also necessary to function as a manager for success in this position. The safety positions discussed were 1.) insurance, company safety engineer that works with company clients, and surely requires management skills: 2.) the corporate safety director and safety engineer, many times part of top management; and 3.) safety engineer, found throughout industry and obviously requiring managerial skills (Ferry, Weaver, 1976, pp. 171-180).

Peterson (1978) another leading safety expert's belief is the safety practitioner functions are located in the following four major areas:

> A. Identification and appraisal of accident-and loss-producing conditions and practices, and the evaluation of the severity of the accident problem.
>
> B. Development of accident prevention and loss-control methods, procedures and programs.
>
> C. Communication of accident and loss-control information to those directly involved.
>
> D. Measurement and evaluation of the effectiveness, of the accident and loss-control system and modifications needed to achieve optimum results (p 43.).

From Peterson's view applications of all or some of these functions will depend upon the involvement of the safety practitioners and the nature and scope of the existing accident problem.

The safety practitioner functions in a staff position to the line organization. They serve as a mentor and provide the safety moral values to the organization.

They use their knowledge and skills to influence all levels of the line organization. This is a sensitive position and safety practitioners have to realize this, and use this knowledge skillfully, in dealing with line managers. This does not mean that their mentoring is to be weakened in any way. Safety personnel should work closely with the engineers of the organization to make sure safety is considered in the design process. The safety position requires knowledge and skills in many disciplines and uses this information in a consultative status to the line organization (DeReamer, 1980, pp. 337-365).

In the 1970s, after the enactment of the Occupational Safety and Health Act (OSHAct), the National Institute of Occupational Safety and Health (NIOSH) funded a grant for an extensive study of the knowledge and skills required to function as a safety and health practitioner. The information obtained from this study resulted in additional reports regarding an academic education for safety practitioners. The Board of Certified Safety Professionals (BCSP), in 1980, utilizing the information attained by this study published a proposal for a *Curricula Development and Examination Guidelines.* This subsequently became known as BCSP Technical Report No. One, (Vernon 1980).

These recommendations were sustained on evaluating BCSP certification examinations and NIOSH studies germane to the performance of safety practitioners. The proposal was the foundation for a second report, entitled *Curricula Guidelines for Baccalaureate Degree Programs in Safety,* which is known as BCSP Technical Report No. Two. (1981). The No. Two Report was a joint effort approved by the ASSE and BCSP.

The safety practitioner in most organizations is a generalist because of the variety of activities required of this position. Consequently multifarious knowledge of safety is necessary for a successful performance. The manifold amount of information, for the safety function, is so vast it is not feasible for safety personnel to have in-depth knowledge of all activities. Safety experts agree on the variety of knowledge and skills required by the safety practitioner and as a result requiring a variety of courses to be taken at the college level. It is advisable for the practitioner to continue learning since knowledge is the cudgel of safety personnel. Continuous education is a must for this position. As Hammer (1981) stated "safety personnel must keep informed on latest developments" (p.101). It applies to the graduate from a safety school as much as it does to a person who has educated him or herself in safety.

The safety position serves as staff or advisory to line personnel. "The safety practitioner may have been given the responsibility for accomplishment of specific assignments, but the ultimate responsibility is still with the manager in control" (Hammer, 1981, p.99). The safety practitioner has a staff function in acting as a facilitator to line management to accomplish the goal of safety and health for the workers. Line managers are responsible for attaining the safety and health goals. In order to perform this responsibility top management has to provide the incentive. In other words line management has to be given the authority to accomplish the responsibility.

> "Once management's commitment to the goal of safety and health is attained the safety practitioner can get to the important functions of dealing with workers' compensation, collecting and analyzing statistical records, economic analyses, safety and health training, and dealing with both hazards and violations of safety and health standards"(Asfahl, 1984, p.32).

The safety practitioner has to provide the motivation, advice and training to line managers to achieve the safety and health goals. It must not be assumed that line management will perform their safety and health responsibility without proper stimulation.

Ned K. Walters, from a presentation at the ASSE Professional Development Conference (PDC), June 1981, also appeared in professional safety, August 1983 discusses DuPont's approach to occupational safety and health (OSH). Mr. Walters states that OSH is a line management responsibility and that the safety practitioner provides expertise on OSH matters, functioning from a staff position. "At DuPont the chief executive officer is viewed as the chief safety officer and is so committed as are all other executives" (Ferry, 1985, p.79). Ferry also states line management is responsible for preventing occupational injuries and illnesses and are charged with providing effective safety training for all employees. Top management talks safety at DuPont and more importantly they walk their talk. Management can set a good example for the workforce by being visible using proper personal protective equipment when walking through the plants. Another example is not to give silent assent to unsafe conditions or practices. This approach provides an example for all employees to follow.

A study was conducted, by Dillon (1985, pp. 27-62) with the purpose to determine performance expectations of corporate safety practitioners. A survey questionnaire, using the Delphi technique, was sent out to "the jurors" requesting them to rank a list of functions essential to this position. A literature review was used to develop this list of expectations. The respondents reported the following, in order of rank, expectations:

1. Seeking active support for safety function affairs from management.

2. Serving as a "consultant" to management for the development of policies and regulations; and

3. Developing safety related polices for the organization.

Based on a lack of information regarding the necessity of technical skills for this position, respondents appeared to believe that managerial functions were more important for success as a corporate safety practitioner.

According to Bird and Germain (1986) the safety practitioner should use a management approach to safety since it is not practical to eliminate all accidents. The management concept would provide the means to reduce injuries and all other types of accidental losses. Bird and Germain further point out it is logical for the modern practitioner to see the management concept since this position is concerned with, "union activities; consumer agitation; litigation, technology advancement; workforce turnover; inflation costs for insurance; workers' compensation, and repairs due to accidental damages; medical research; and efficient energy" (p.8). This entire list of activities would be best handled by a management approach.

Again, line management is considered to have the final responsibility for the safety activities of the workforce. This responsibility has to begin at the top level of management and delegated down through hierarchy. The first level supervisor is the vital ingredient of this process. This line manager is in constant contact with the workers. The safety practitioner should be a member of the management team since they must deal with a vast amount of many different types of activities. Safety personnel serve in a staff capacity. Practitioners are generalists since a wide range of knowledge is required for a successful performance. "Their role is to administer safety policy, to provide technical expertise to train supervisors in safety techniques, to conduct safety promotion, and to keep management informed of status of the program" (Anton, 1989, p.45). In essence the safety position is a safety consultant to the line and other staff members of management. Their main function is to assist line and other operating managers to perform their safety responsibilities easier and more efficiently.

A considerable amount and a variety of knowledge and skills is necessary for a safety practitioner to successfully function. " The qualifications for a safety practitioner should include (1) knowledge of hazards, safety principles and techniques; (2) knowledge of engineering; and (3) knowledge of business administration" (Grimaldi 1989, pp.114-115). There is a great deal of controversy among modern safety experts as to whether a management education or an engineering type of education best serves safety personnel. Obviously both types of knowledge and skills would be helpful as well as knowledge and skills from a vast number of other disciplines. Safety engineering is sometimes considered the ethical motivator of industrial operations. It certainly provides moral values for the engineering profession. Seiden (1989, p.3) states "basically it is a human science that is qualitative and practical as well as quantitative and theoretical." Seiden goes on to say "safety is concerned with the recognition, evaluation and control of hazards and risks." Safety is not only the moral, but also the most economical road for an organization to follow for the long haul. Safety practitioners, using cost-benefit analysis, and working with line managers have devised economical solution to costly safety problem. Psychological, financial and managerial skills would support advocates of a curriculum to include business skills.

From 1990 to Present. A study was conducted by the University of Southern California to determine a profile of occupational safety and health professionals. Current students and graduates of the schools' occupational safety and health academic program were surveyed. The results indicated that "safety and health professionals were fully aware of the multidimensional and multidisciplinary nature of their field. They understand the need for knowledge of biology, chemistry, physics, engineering, law, psychology, management, education, and numerous other disciplines" (Erickson, 1991, pp. 33-34). It is not surprising that safety practitioners recognize the knowledge and skills required to function in the profession, since a lack of information to perform a task is most frustrating. It was interesting to note that they were aware of course needs to correct any dearth of such knowledge and skills.

Safety practitioners are employed by many types of employers and perform a variety of functions. In fact, their type of employment may very well influence the activities for their position. They may be employed in "healthcare, insurance, construction, manufacturing, transportation, academia, or mining" (Brauer 1992, p.17). Thus functions may vary with their employment. Brauer also suggests "that the functions of safety practitioners span a number of disciplines." Furthermore; as a discipline, "safety is distinct from, but involves elements in business and management, engineering and technology, education and training, health and medicine, law and government and many more" (p.17). Although the working environment will probably influence the functions of safety personnel, there exists a commonality of knowledge necessary for all safety and health practitioners (Brauer, 1992, pp. 16-21). This once again reiterates the diversity of the safety position and the need for educators to review their curriculum from time to time.

Laing, (1992 p.80) enumerated in the Accident Prevention Manual for Industrial Operations Administration and Programs there are four chief functions of the Professional Safety position.

The major areas are:

A. Identification and appraisal of accident and loss producing conditions and practices and evaluation of the severity of the accident problem.

B. Development of accident prevention and loss control methods, procedures and programs.

C. Communication of accident and loss control information to those directly involved.

D. Measurement and evaluation of the effectiveness of the accident and loss control system and the modifications needed to achieve optimum results.

The safety professional in performing these functions, according to Laing (1992) will draw upon specialized knowledge in both the "physical and social sciences." It will be necessary to apply the principles of measurements and analysis to evaluate safety performance. A fundamental knowledge of statistics, mathematics, physics, chemistry, as well as a basic knowledge of engineering principles will be required (p.80). Laing goes on to say knowledge of behavior, motivation, and communications will be utilized. " Knowledge of management principles as well as the theory of business and government organization will, also, be required" (p.80). The challenges of the future for a safety position stated by Laing as "needing a unique and diversified type of education and training" (p.80). This again justifies rationale for continuous education by the safety practitioner as well as institutions and educators continuous monitoring of the needs of the safety profession.

A cogent safety and health curriculum would include "all fields of endeavor for which the generic base is hazards. Then logically such areas as occupational safety, health, environmental affairs, product safety, public safety, transportation safety, public health, physics, system safety, fire protection engineering, and the like should be included" (Manuele, 1993, p.24). This expert advocates course work in a broad variety of safety areas and is indicative of the complexity of planning an occupational safety and health curriculum.

Soule (1993) conducted a study to determine the appropriateness of the safety science curriculum at the Indiana University of Pennsylvania (IUP). The research surveyed graduates, their faculty, and their employers to judge if graduates were prepared for the responsibilities of their current positions. The research indicated that "IUP was successful in many areas, the most significant weaknesses... (1) environmental management; (2) management skills' (3) computer applications; (4) worker' compensation, and (5) risk management/insurance areas" (p.71). It was concluded that in addition to technical skills, curriculum be expanded to better encompass "computer applications and management skills" (p.84). According to the literature this study is in agreement with similar studies of this type.

It should be emphasized the modern health and safety manager is concerned with issues "that are multifaceted and complex" (Goetsch 1993, p.111). These issues, according to Goetsch, include such diverse topics as: "stress; explosives; laws; standards, and codes; AIDS; product safety and liability; ergonomics; ethics;

automation; workers compensation; and an ever-changing multitude of others" (p.111). Changing legislation, technology, and culture is continually adding to this list of concerns. Since it is unreasonable to expect one individual to possess expert knowledge in all these areas, Goetsch states "health and safety management has evolved into a team concept of operation" (p.112). In fact, the safety practitioner is dependent upon many other discipline experts to assist in performing the health and safety functions. The team concept of management, for heath and safety is similar to other modern management team concepts (Goesch, 1993). Safety practitioners/engineers use technical procedures for the elimination or reduction of hazards. Therefore, engineering knowledge and skill is a definite asset. This expert suggests that both managerial and technical skills are necessary for a safety practitioner and development of safety and health curriculum.

"Early on many ergonomic principles were not incorporated into existing operations because of a lack of awareness among engineering and safety personnel" (Mims and Kolbe-Mims, 1994, p.218). Once a new design is implemented, it is necessary for safety personnel to evaluate the operation to insure the operation is safe. These types of safety issues need to be worked on by the safety practitioner and engineer. Lending each other's expertise for the better of the organization and employees. Ergonomics may at this time, be brought into a course relevant to the college program, for future graduates.

Another safety authority Mims (1995) agrees with almost all other health and safety specialist that safety functions are a staff or advisory capacity. Then it may be inferred that line management is responsible for the every day safety and health of the workforce. It is further suggested that the safety division is the nucleus from planning and unifying the safety activities.

More specifically, the safety practitioner:

- Carries out specific hazard identification and analysis.
- Supervises and appraises the performance of all disciplines involved in the life cycle of a product.
- Originates and directs corrective action and recurrence controls.
- Communicates performance findings to all levels of management.
- Underscores line organization responsibility and accountability for safety.
- Provides visibility of results to management.

It is the safety practitioners' obligation to make the safety tasks of line managers user friendly and doable (p.234).

The health and safety coordinator/safety practitioner should be responsible for "the hazard management process, the organization of it for reviewing its progress. These responsibilities include organizing meetings, seeking information sources for assessment, inspection of workplaces, monitoring compliance with legislation, assisting people at all levels of the organization" (Taylor, Easter, Hegney 1996, pp. 81-82). Although suggested by Australian occupational health and safety experts it is much the same as found in the literature for the USA safety authorities.

The result of a study by safety practitioners, using certified safety professionals as judges, to determine information was conducted with over 50 percent of the respondents ranking the following topics 3.5 out of a possible 4.0:

> Accident causation and investigation; behavioral aspects of safety; computer applications; environmental safety; ergonomics;

ethics; fire safety; hazardous materials; industrial hygiene; performance measurement; safety and health regulations; risk management; safety internship; safety management; safety training; workers' compensation; and written and verbal communications.(Ferguson, 1995, p.45).

The result of this research coincides with similar research found in the literature, safety is diverse and covers many disciplines, thus a curriculum updating is important.

In discussing the scope of the professional safety position Tarrants (1963) is quoted by Kohn (1996, p.14-15) that according to the ASSE, the scope of the Professional Safety Position is as follows:

> To perform their professional functions, safety professionals must have education, training and experience in a common body of knowledge. Safety professionals need to have a
>
> fundamental knowledge of physics, chemistry, biology, physiology, statistics, mathematics, computer science, engineering, mechanics, industrial processes, business, communication, and psychology. Professional safety studies include industrial hygiene and toxicology; design of engineering hazard controls; fire protection; ergonomics; system and process safety; safety and health program management; accident investigation and analysis; product safety; construction safety; education and training methods; measurement of safety performance; human behavior; environmental safety and health; and safety, health, and environmental laws, regulations, and standards. Many safety professionals have backgrounds or advanced study in other disciplines, such as management and business administration, engineering, education, physical and social sciences, and other fields. Others have advanced study in safety. This extends their expertise beyond the basics of the safety professional.
>
> Because safety is an element in all human endeavors, safety professionals perform their functions in a variety of contexts in both public and private sectors, often employing specialized knowledge and skills. Typical settings are manufacturing, insurance, risk management, government, education, consulting, construction, health care, engineering and design, waste management, petroleum, facilitates management, retail, transportation, and utilities. Within these contexts, safety professionals must adapt their functions to

> fit the mission, operations, and climate of their employer.
>
> Not only must safety professionals acquire the knowledge and skill to perform their functions effectively in their employment context, but also through continuing education and training they stay current with new technologies; changes in laws and regulations, and changes in the workforce, workplace, and world business, political, and social climate.
>
> As part of their positions, safety professionals must plan for and manage resources and funds related to their functions. They may be responsible for supervising a diverse staff of professionals.
>
> By acquiring the knowledge and skills of the profession, developing the mind set and wisdom to act responsibly in the employment context, and keeping up with changes that affect the safety profession, the safety professional is able to perform required safety professional functions with confidence, competence and respected authority.

This statement of the scope and functions of the safety position established the elements in developing an OSH curriculum. There is not much disagreement, among safety experts, to the contents of this description, the assertion is sufficiently broad to permit all factions to embrace it over time.

Two surveys, conducted in 1989, defined safety professional competencies. First a study by Indiana State University, according to Carruthers (1996 p.59), indicated the five most important skills necessary for safety programs success were; hazard recognition; verbal communications; written communications; safety training; management ability. The six areas where development was needed for advancement were management ability; computer science; industrial hygiene; ergonomics; hazardous materials; fire science. Carruthers (1996) citing another study by Lon R. Ferguson of Indiana University of Pennsylvania, USA, focused on the "Appropriateness of major content topics in baccalaureate safety curricula" (p59). The following in the top 50 percent of responses: Verbal Communications, Accident Causation and Investigation, Written Communications, Industrial Hygiene, Safety and Health Regulations, Safety Management, Safety Training, Environmental Safety and Health, Hazardous Materials, Ergonomics, Computer Applications, Measurement of Safety, Performance, Ethics, Fire Safety, Risk Management, Behavioral Aspects of Safety, and Design for Engineering Hazard Control (pp.58-59). This survey, too, helped define safety competencies, based on importance of job and the future, pertinent to a never-ending need for curricula revisions and research.

The American Society of Safety Engineers (ASSE 1996 [online]) states:

> "that the broad field of safety is concerned with the inter-action between people and the physical, chemical, biological and the psychological forces which affect their well being. It is necessary to realize that all of these forces influence or affect people simultaneously, therefore the safety professional cannot study one area without studying the effects of others."

Once again emphasizing the need for management, technical, psychological and other knowledge and skills to function as a safety practitioner.

According to Kohn (1996, pp.15-17) the functions of the professional safety position as related to the protection of people, property, and the environments are:

- Anticipate, identify, and evaluate hazardous conditions and practices.
- Develop hazard control designs, methods, procedures, and programs.
- Implement, administer, and advise others on hazard controls and hazard control programs.
- Measure, audits, and evaluate the effectiveness of hazard controls and hazard control programs.

It is suggested that, "in the past, USA academic emphasis has been to prepare students for domestic operations. Yet, the reality is that USA graduates work as safety professionals in foreign countries, work with safety professionals in foreign countries and hire safety professionals educated in foreign countries. In 1996, the ASSE boasted 32,000 members with 525 international members who work in 54 countries" (Helmrich-Rhodes, 1997).

Today more than ever there is no longer a USA economy, it is a Global Economy. Countries such as Japan, Germany, South Korea, England, Italy, Canada, USA and other major industrial powers have set up joint ventures in other countries, either in collaboration or by themselves. Also, with the advancement of International Organization for Standardization (ISO) 14,000 standards, safety and health programs are getting more standardized to meet local as well as international requirements (Shah, 1997). It appears to be the position of the last two safety experts above, Heimrich-Rhodes and Shah, that safety and health curriculum should include material relative to a global economy. It was even suggested that foreign languages should be advised for some safety and health students.

Apparently the interest in a quality safety and health education, peaked in 1997. It was in March 1997 that a group of safety and health educators arranged a conference to air their views. Approximately fifty (50) OSH educators gathered in Las Vegas, Nevada and suggested methods of improvement for safety education (Kolbe-Mims, 1997). As a result of this conference one of the attendees, G. LeBar Managing Editor of Occupational Hazards (OH), conducted a mini-survey in the Occupational Hazards publication. This survey was published in the May, 1997 issue and reported in the September 1997 issue. According to this survey: "Safety and health professionals would like to know more about international safety, industrial management and accounting, and a lot less about calculus" (LeBar 1997, p.55). Calculus is an integral component of most USA safety and health college curriculum for a baccalaureate degree. It has been and remains the most controversial of the required courses for a baccalaureate degree in OSH. It is logical to surmise that this course requirement has its roots in the early OSH curriculum when various engineering disciplines made curriculum recommendations.

Richardson (1997) alleges that "currently safety practitioners are confronted with an increasingly complex and dangerous business environment. The advancement in technology has not only presented many new hazards, but also enables us to identify many previously unrecognized hazards in the workplace and the environment" (p.358). This alone provides support for continuous course revisions and development. We had minimal, if any, violence or security problems in schools and organizations a decade ago, now we need to look at ways of protecting our children and employees in another way. This adds not only to the dilemma of the safety practitioner, but also the developers of OSH curriculum to provide the knowledge to deal with security problems.

A study was conducted to determine occupational safety management competency required by safety practitioners. This research used safety educators and certified safety professional practitioners as referees. Another objective of the study was to ascertain any difference in judgment of the two groups of referees. The results indicated a sharp difference in how educators and practitioners view the safety role. Like previous researchers, in the literature, technical, management and communication skills were judged to be equally important. It was concluded that safety practitioners in the beginning of their career need technical skills as they progress management and communication skills become increasingly important (Blair, 1997, pp.1, 7, 130-132).

Safety, is a multidimensional subject, which presents a major challenge for planners of academic safety and health curriculum. A quandary exists since there are a variety of seemingly appropriate courses to provide the knowledge and skill requirements to successfully function as a safety and health practitioner. The problem is exacerbated by college and university administrative limitations on the number of credit hours permitted for baccalaureate degrees. "Safety is an interdisciplinary field involving many disciplines, for example, engineering, education, life sciences, to name a few. Certainly the safety professional's knowledge and skill in communication and problem solving is essential. In fact, it is difficult to suggest any college or university courses that would not prove beneficial to a safety professional in performing the safety function"(Mims, 1997, p.17).

Early on most safety problems were defined by unsafe conditions and technical knowledge was essential for safety practitioners. Thus an engineering education proved most beneficial. Currently many, and for many years safety professionals have been citing unsafe acts as the culprit for a preponderance of the safety problems. To be more specific, at least, eighty-five percent (85%) of accidental injuries in American industries result from unsafe acts. Concurring with this philosophy then motivation and training would be a logical method of improving the situations (Kolbe-Mims, 1998, pp.36-40).

Safety and health academicians seem to suffer ambivalent feelings when attempting to prescribe a standard curriculum for a safety and health baccalaureate degree. A major part of this attitude is the broad field applications of the safety profession.

> "Dedicated safety professionals are at odds as to what the basic academic preparation requirements for one entering into and practicing in the broad field of occupational safety should be. On one hand some state that the safety professional should be well versed in the sciences especially engineering. While on the other hand there are those that profess the practicing safety professional should be well versed in the management area. Still others claim the practicing safety professional needs to have a combination of technical and management skills and the ability to communicate effectively and be a problem solver." (Hansen & Murray, 1998 p.1).

During two conferences of USA safety and health educators topics of discussion indicate a profound interest in improving the safety and health curriculum. This is evidence by a sampling of attending educators during the 1995-1997 time period. One of the problems with the occupational safety and health curriculum plight was that safety degree programs emerged from existent university departments. "They can be found in departments of technology, physical education, health education, health science, management, environmental health, public health, fire and protection services, safety management, safety science, safety education, industrial education, community health, and the list goes on. Missing from the list is a preponderance of engineering departments"(Hansen and Murray, 1998). Perhaps this is rationale for the dissatisfaction with such courses as calculus being a requirement for an occupational safety and health curriculum. Unquestionably engineering knowledge serves a safety professional well, but so does knowledge and skills in a number of other disciplines thus presenting a difficult problem. Calculus is a prerequisite to matriculate in an engineering discipline; however, is it necessary for a safety career?

It is argued that:

> "safety practitioners play a primary role in developing and implementing a safety management system. First it is necessary to sell the system to management in order to obtain their commitment. Next, in conjunction with supervision, work on refining the organization's safe practices into clear language and useful tools. Then it is time to implement the safety management system with one-on-one contacts, coaching and formal safety training" (Schaechtel, 1998, p.24).

Once the system is well established there will be more time for the important process of mentoring and training. Mentoring and training is a continuous procedure and increasingly improves the safety performance (p.24). Schaechtel presents an argument for a safety management position and suggests training activities to accomplish the OSH goals. He does not elaborate on any specific knowledge to accomplish these goals.

Safety Management is defined by Della-Giustinia, (1998) as "a process of protecting human resources, preventing property resources and promoting efficacy resources on an organizational level." Della-Giustinia, goes on to define management as "a process of reaching organizational goals by working with and through people and other organizational resources"(p.289). The purpose of safety management is to protect all employees, conserve all property, and use all the resources efficiently. Slavin (1998) discussed the following skill set for the safety and health professional as proposed by the National Safety Management Society: Communications, Ergonomics, Industrial Hygiene, Labor Relations, Management System Audits, Product Safety, Off Job Safety, Workers' Compensation, Computer

Literacy, Strategic Planning, ANSI standards, OSHA standards, OSHA Enforcement, Behavioral Safety, Environmental Laws. These are all-important to a curriculum as well as a practitioner and need to be reviewed as technology and laws change.

In a 1999 national safety survey conducted among the readers of the Occupational Hazards Magazine reflected that "safe jobs usually involve duties covering a number of management and technical disciplines." This study is in accord with previous research reported in the literature (Minter, 1999, p.27).

Manuele stated, (1999, p.20), "The Hazard Review Committee will conduct all phases of design review for equipment and processes." The Safety, Health, and Environmental Practitioner (SHEP) are an essential resource for this committee. "SHEP will assist in identifying and evaluating hazards in the design process and provide counsel as to their avoidance, elimination and control" (Christensen and Manuele, 1999). This is suggesting that the safety practitioner needs technical and management knowledge and skills to fulfill obligations since the design team will come to them for advise on the understanding of codes, regulations and so forth.

Although an inference may be assumed from the title American Society of Safety Engineers that the function of the safety practitioner is largely of an engineering nature this may be misleading. The ASSE appears to assign the staff function to safety managers in the following passage:

> Safety managers recognize and devise methods to control Hazards with management skills and techniques needed to administer a department or facility. The safety manager may direct the safety program of a large plant, corporation or department within local, state or federal government. (ASSE 2000, career [online])

"Safety managers must have a sound understanding of management principles, a complete knowledge of the organization, the ability to get along with people and be skilled in effective communication to function successfully" (Gordon 1976). The safety practitioner should devote a major portion of their time to advising, training and motivating line and other members of staff management. They should not become a victim of spending a large portion of their time on such routine activities such as inspections (Gordon1976, Hazard Control Manager, Spring 2000, p.1). The above statements apply to most of the management proponents in this literature, suggesting mentoring and training without providing tools to accomplish these goals. This research was to locate some of those knowledge and skills to prepare the safety practitioner to do the job. Once those knowledge and skills were identified development of a curricula could begin.

Summary

The modern safety practitioner certainly requires a vast knowledge of many disciplines for a career in OSH. Therefore the safety and health curriculum debate continues. The evidence is overwhelming that the experts, past and present, are generally in agreement on many of the generic functions of a safety professional. On the other hand, interpretation of the general functions into specific responsibilities may alter the consensus to some degree. In addition, the type and culture of the enterprise plays a major role with specific functions. For example, the safety and health priorities would differ for food or foundry, nuclear or automobile assembly operations, and so forth. Also, it would differ for the type of enterprise; that is, manufacturing or service, institutional or mining operations. Considering that the safety and health priorities are different, thus the role of a safety practitioner would vary. As long as the basic functions remain similar, a model safety and health curriculum can be achieved.

Functions of the occupational safety and health practitioner are needed to have a knowledge base to establish a college and university curriculum. The review of literature most authors agreed on the basic functions. There continues to be controversy on whether technical or managerial type courses are advantageous to a safety practitioner. There was little, if any, mention of experiential learning in the literature review, although this researcher finds it important to a safety and health curriculum as well as a safety student. Experiential learning will allow the student to see and learn to develop some of these skills mentioned by the literature. With the technology and legislation culture under constant change, graduating safety students see a need to continue their educational studies, as do developers of curricula see the need for revisions.

Perhaps Adams (June 2000 p.27) sums it up best with the following:

> The ideal safety professional has a balance of technical and managerial skills. To be effective, a safety professional must be both engineer and manager. When this equation falls out of balance, it creates a rift between the "safety engineering" school of thought and the "safety management" school of thought. This rift can only prevent safety from being seen as a true profession--and it threatens to further divide the two camps whose collective energy should be focused on protecting employers and employees who count on them.

CHAPTER THREE

METHODOLOGY

As previously stated the primary purpose of this study is to determine if a model Occupational Safety and Health (OSH) baccalaureate degree curriculum, in the USA could be developed. A secondary goal was to determine if Occupational Safety and Health practitioners and Occupational Safety and Health educators would agree on course offerings. Since safety and health baccalaureate degrees exist in the USA, then a logical conclusion indicated a curriculum was present. A literature search, as well as networking with safety and health personnel, suggested dissatisfaction with current safety and health course offerings. As a means of achieving the established goals it was evident that a methodology had to be developed.

Development of Instrumentation

The essence of the study goals explicitly direct attention to a need to collect data from two sources, namely safety practitioners and safety educators. Normally a survey is used for collecting such information. The design, development and administration of instrumentation to deal with this phase of the study presents a principal area of concern. A decision was made to use the Delphi technique. This is a system, developed by a research and development organization, the Rand Corporation, as a means of short-term forecasting. This instrument is designed to use questionnaires, although, the process for data gathering and examination differs from standard methods. It demands collaboration of a panel of experts of the completion of a sequence of questionnaires. The data sought by this device normally is concerned with the authority's judgment relative to a particular subject matter. This tool uses a procession of questionnaires; four were employed for this study. Each of the series of questionnaires was evaluated to obtain a group consensus and this information was used as feedback to a pilot group of participants. Responses were analyzed then summarized and submitted to the experts with each revised questionnaire. "Note that the goal of the Delphi approach is not to produce a single answer as output but to produce instead a relatively narrow spread of opinions within which the "majority" of experts concur". (Anderson, Sweeney, Williams 1990, p.687).

Pilot Population

Practitioners. Twenty-five (25) safety practitioners were chosen as one of two pilot groups for this study. Almost all of these subjects possessed a baccalaureate degree; however, not necessarily in an OSH discipline. All of them were employed full-time in OSH and had, at least, five (5) years of OSH experience. Additionally, participants were selected from different geographical sections of the USA, as well as from different types of working environments.

An endeavor was undertaken to choose subjects by job titles, as a method of discovering hierarchy of position. This proved to be a fruitless effort since there are many titles without any distinct or specific meaning for OSH activities. For example, safety professional, safety engineer, safety manager, safety and environmental manager, safety and industrial hygienist, risk manager, safety specialist and safety consultant. The answer rests in the type of position the safety practitioner seeks. Utilizing various safety and health directories the listed titles were helpful in a random selection of safety practitioners to be chosen for the pilot group and, also, used for the final survey.

Educators. The second representation chosen for the pilot group consisted of twenty-five (25) occupational safety and health educators. Subjects were randomly selected from universities with a four-year- degree program where the primary focus is OSH.

These same criteria were used to select candidates for the general population on the final survey, which was sent to four hundred eighty nine (489) individuals. A major source of respondents for the general survey was an American Society of Safety Engineers (ASSE) brochure entitled "Safety and Related Degree Programs, 1998-99". Other sources included World Safety Organization (WSO), American Industrial Hygiene Association (AIHA) National Safety Council Business and Industry (NSC/B&I) directories. Another leading source resulted from investigating OSH degree programs listed within universities on the internet. Degrees programs investigated ranged from obviously related titles, such as, occupational safety and health, risk manager to less recognized titles, such as, industrial technology concentration in safety, safety management and the like.

Measurement

The *critical incident technique*, *Delphi technique*, and *Likert scale*, were used as ways of obtaining data, and judgments from the responding panel. Then respondents were asked to indicate their degree of agreement or disagreement with each statement in the form of a questionnaire, using a *Likert scale*. Each response is associated with a point value, and an individual's score is determined by summing the point values for each statement (see table 2). Rank order was used in the surveys. Subjects are arranged in order of score and each subject is assigned a rank. As Guilford stated (1950, p. 29) "Measurements in terms of rank order simply give us the serial arrangement of things."

The independent variables being studied:

1. Educators, courses important to safety and health
2. Practitioners, courses important to safety and health

With the use of contingency tables for educators and practitioner's rate of importance, as depicted in table one (1).

Table 1

Contingency Table

	Extremely Important	Important	Somewhat Important	Not at All Important	Totals
Educators	19	5	1	0	25
Practitioners	17	6	2	0	25
Totals	36	11	3	0	50

Table 2

Likert Scale For Respondent to Rate Importance

Place an (x) in the box that best reflects the importance to a Safety and Health Curriculum

Professional Core	4 Extremely Important	3 Important	2 Somewhat Important	1 Not at All Important	Person 1 Score
Analysis and Design For Safety			X		2
Construction Safety			X		2
Elements of Environmental Safety		X			3
Ergonomics/Human Factors Engineering	X				4
Experiential Occupational Safety and Health Learning; Internship			X		2
Fire Protection / Prevention and Control		X			3
Fundamentals of Industrial Hygiene and Toxicology		X			3
Introduction to Security				X	1
Legal Aspects of Occupational Safety and Health			X		2
Methodology For Safety Training			X		2
Motor Fleet and Transportation Safety				X	1
Principles of Occupational Safety	X				4
Psychological Aspects of Safety and Health		X			3
Safety and Health Management		X			3
System Safety Analysis		X			3
Preparation courses					
Chemistry with Laboratory and Including Organic			X		2
General Statistics			X		2
Human Anatomy and Physiology			X		2
Physics with Laboratory			X		2
Other Requirements					
Communications	X				4
Production Concepts			X		2
Fundamentals of Computer Science		X			3
Elementary Business Administration (Include Budgeting)		X			3

Total Score of person 1 = 58

Data Collection Methods

A verbal survey was the instrument of choice to inaugurate the survey. Several colleagues were approached with a request to participate in this study. Twenty- two (22) candidates, eleven (11) educators and eleven (11) practitioners, agreed to serve and were elected to the pilot panel with the understanding that they would participate in the entire study. Both telephone and face to face interviews were adopted to conduct this phase of the survey. A few of these early questions considered demographics; however, the majority of questions dealt with the information required to successfully function in the working world as a safety practitioner. Several questions were posed regarding university OSH curriculum for a baccalaureate degree in this field. Another set of questions involved prerequisite courses, currently used by many USA universities, for matriculating into a curriculum leading to a baccalaureate degree in OSH; for example, mathematics, chemistry, physics, human anatomy, computers, and so forth. These questions evolved into a digression regarding the necessity for knowledge contained in these courses for a successful career in OSH, (see verbal survey Appendix A).

This verbal process engendered useful information, as by-products. A couple of these proved most worthwhile. First, other colleagues as well as other sources were suggested in this verbal approach. Second, brainstorming assisted with the development of the questionnaire, as well as time limits for administration of the questionnaire.

As a result of this initial survey the pilot group was expanded. The current pilot group members who thought they would add value to the study recommended individuals. A few other sources, such as USA government and other OSH group listings for additional subjects to be used in the general survey were also referenced.

The National Institute of Occupational Safety and Health (NIOSH) and the National Safety Council (NSC), the American Industrial Hygiene Association (AIHA) provides a rich source of prospective subjects. Telephone or e-mail was used to contact the additional prospective subjects in an effort to select the most appropriate candidates. In the final analysis fifty (50) subjects were chosen for the pilot group, consisting of twenty-five (25) safety practitioners and twenty-five (25) safety educators.

Letter of Transmittal

Evolution of Survey I. From the interview questions, a critical analysis of the information was evaluated and a short questionnaire was devised to be mailed to each person in the group of educators and practitioners in a self addressed stamped envelope (see Appendix B).

After two weeks had passed a follow-up e-mail reminder was sent to each individual that had not returned the survey. After another week had passed the ones who did not respond were phoned and/or e-mailed again with an attached or mailed survey. This received various responses from thanks for the reminder to you are on my to do list. For various reasons, a few stated they were unable to participate any longer, due to a move or job change. A few more did not respond and were dropped. A necessary modification resulted in the rejecting and replacement of a few of the pilot group members. This group of pilot members was continued throughout the remainder of the research following the response to the first survey. The end result was fifty (50) proper subjects.

Figure one (1) depicts results of survey I sent and returned. Thirty-eight (38) practitioners and thirty-six (36) educators were sent survey I for a total of seventy-four (74) surveys sent out in self addressed stamped envelopes. Twenty-five (25) educators

and twenty-five (25) practitioners responded to survey one, which became the pilot group.

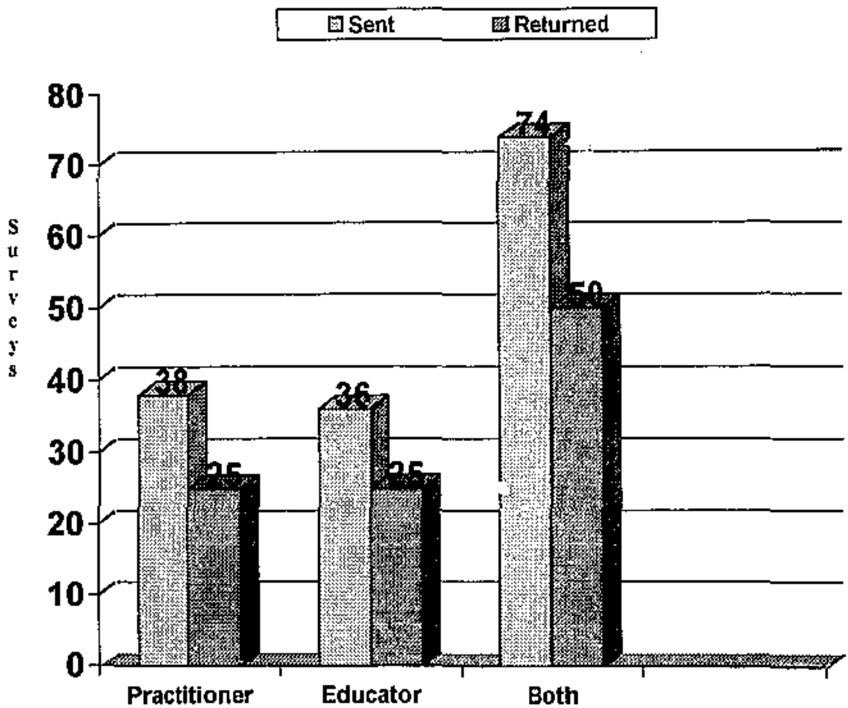


Figure 1

Written Survey One Response Rate Pilot Group

69% practitioners returned survey I

66% educators returned survey I

68 % both practitioners and educators returned survey I

The overall response to survey one was the safety practitioner's primary objective is to:

- ♦ reduce work-related injury and illness.
- ♦ reduce operating cost through safety.
- ♦ increase safety awareness at all levels of the organization.
- ♦ implement and oversee health and safety policy.
- ♦ comply with legislative standards for the industry.
- ♦ fit with organizational culture of the enterprise.
- ♦ encourage and support employee involvement.
- ♦ have common sense, and dedication to the job.

Within the scope of the objective would include other functions; that is,

- ➢ recognize
- ➢ evaluate
- ➢ monitor and
- ➢ control hazards, and so forth.

<u>Evolution of Survey II.</u> Each survey I was reviewed to create a list of all topics. The information from suggested course names were included in the list. Nevertheless, course titles were reserved for the final survey. The first page was a cover letter explaining the consensus of the group and what to do with this next survey. There were three (3) pages of knowledge, skills and topics created with the information received in the first survey of the pilot group. Using a Likert type scale, each pilot group was to mark how they felt it was important to a safety and health

practitioner's occupational safety and health curriculum. This was for the purpose of constructing survey II.

> The Likert method is based on the assumption that an overall score based on responses to the many items reflecting a particular variable under consideration provides a reasonably good measure of the variable. These overall scores are not the final product of index construction: rather; they are used in an item analysis to select the best items (Babbie 1992 p.180).

Survey II was now created and sent to the pilot group of educators and practitioners, along with a self addressed stamped envelope (see Appendix C). The pilot group was allowed nearly four weeks to return the survey. All survey headings included researcher's address, e-mail, phone number and fax number in the event they had questions or concerns about the survey. Each survey was coded to allow for contact purposes only, the opportunity to know who were the non-respondents. Again, an e-mail reminder was sent out after two weeks, making sure they did, indeed, receive survey II. There were as many as three e-mail reminders sent to the ones that did not respond or return survey II. Ultimately all fifty (50) of those contacted responded via e-mail or USA mail in the returned self addressed stamped envelope, with appropriate responses. This group of fifty (50), twenty-five (25) educators and twenty-five (25) practitioners remained stable throughout the data collecting process.

Transformation of Survey III. For Survey III each survey II was perused and documented. The information from suggested duplicates were combined, for example computer literacy and internet skills. The results were scored and ranked, again, using rank order. The first page contained a cover letter explaining what the consensus of the group was on survey II. The second page was of knowledge and skills ranked in order of importance. Page three (3) was added at this time with a sampling of course titles that came from earlier surveys and current college and university catalogues. Again, the survey was se t to the pilot group of educators and practitioners with a self addressed stamped envelope. The pilot group was made aware this would be the final survey prior to sending it to a larger population of educators and practitioners (see Appendix D). All surveys had in the heading the researcher's address, e-mail, phone number and fax number in the event respondents had questions or concerns about the survey. A few did, and communication resulted to an excellent advantage. Each survey was, again, coded to allow this researcher, for contact purposes only, the opportunity to know who were the non- responders.

Development of Survey IV. Information developed from the pilot group was used to create the final survey to be mailed to the larger and final group. The information of knowledge and skills was related to a course topic to assemble what is now the fourth (4th) and final survey which was sent to 489 subjects, consisting of OSH educators and OSH practitioners.

The rank score of each survey III item and topic was to determine the combined importance by item. A Likert type scale was included which facilitated a value selection. Each item was being scored in a uniform manner. Each extremely important response received four points, each important response received three points each somewhat important response received two points and each not at all important response received one point.

Like subjects and topics were combined, for example, data base systems and computer concepts, to develop a survey that was organized into three sections, core, preparatory, and elective courses. Several university catalogs were referenced to determine sections and length of program. Most university baccalaureate curriculum is composed of 120 to 130 semester credit hours. For this reason generic course descriptions were not provided, to allow responders to interpret the course description within the context of their own objectives.

Questionnaire review. The final survey was sent out via email, to randomly selected pilot members for critique and understanding. Suggested changes were discussed and implemented. Limiting the survey to three pages, was this researcher's goal.

Population sample. The process of locating large numbers of safety educators appeared monumental. Universities teaching occupational safety courses were viewed from several sources including the internet. Not knowing the school that housed the occupational safety and health departments made it difficult to locate educators. Once the school was located the task of finding the department was an issue. Not all universities have an occupational safety and health department, many are located in the college of education. Some are located in business or engineering and a few in various other colleges. There were a total of ninety-six universities or colleges being sent a survey to the educators of safety. A similar process was used to find a sample population of safety practitioners. Directories from the NSC, B & I Division, ASSE, WSO, AIHA, were all used to randomly select safety professionals working in a safety and health position. Additionally regional locations were considered, with forty-one states and ninety-three different USA companies represented. From a list of five hundred names a list of potential responders was selected to keep the sample of practitioners and educators equal. Each of the names supplied was assigned a code number for purposes of identification.

Data Collection. The initial mailing of survey IV and letter of transmittal (see Appendix E) was sent to a population of 489, including 244 educators and 245 practitioners. Babbie states, (1992, p.207) "If you want to be 95% confident that your study findings are accurate within plus or minus five percentage points of the population parameters, you should select a sample of at least 400." Using the Microsoft Word program a database was established and set up of the sample population. Envelopes for mailing the survey, the survey to be mailed and the self addressed stamped envelope for the survey return were all created and printed out by the researcher. All surveys were mailed by and returned to the researcher.

Within two weeks after the initial mailing date 208 of the 489 surveys had been returned by the survey sample. After a month another 106 surveys had been returned, for a total of 314 (64%) returned.

Follow-up Correspondence. For respondents whose e-mail addresses were available reminders were sent out on three different occasions. According to Babbie, (1992, p.282) it is generally advisable to plan follow-up mailings in the case of self administered questionnaires, sending new questionnaires to those respondents who fail to respond to the initial appeal. A total of 94 (54%) e-mail reminders were sent to non-responders along with another copy of the survey. Follow-up telephone calls were made to all of the non-responders which this researcher did not have e-mail address.

From the follow-up reminders an additional 41 (23%) responders returned survey IV. Some of the returns were by e-mail some responded that they were no longer teaching in occupational safety and health courses, yet others responded as being retired from the field of safety, which created a total of 18 unusable surveys. A total of 337 usable survey responses were received as a result of the mailings with three e-mail reminders, which represents a return rate of 72%.

As completed surveys were returned each was opened, examined and assigned an identification number, along with the date of return. The identification numbers were assigned serially segregating educators and practitioners for later analysis.

Data Analysis

The data from the 337 survey questionnaire respondents were consecutively numbered and recorded onto code sheets and verified to assure the accuracy prior to the analysis of the data.

Safety educators were coded separately numbered (1-171) and the safety practitioners numbered from (1-166) to test the research question: will safety educators and safety practitioners agree on course offerings? There was a 72% response rate (see figure 2) from the total sample including 72.5% educators responding and 71% practitioners responding with 18 undeliverable for various reasons (see Appendix K).

To assure accuracy by doing a second check before analysis was to begin, the data were then entered and stored in a computer spreadsheet. Again, keeping the responses of educators and practitioners responding in a separate spreadsheet as well as a separate spreadsheet for the total population.

Surveys sent

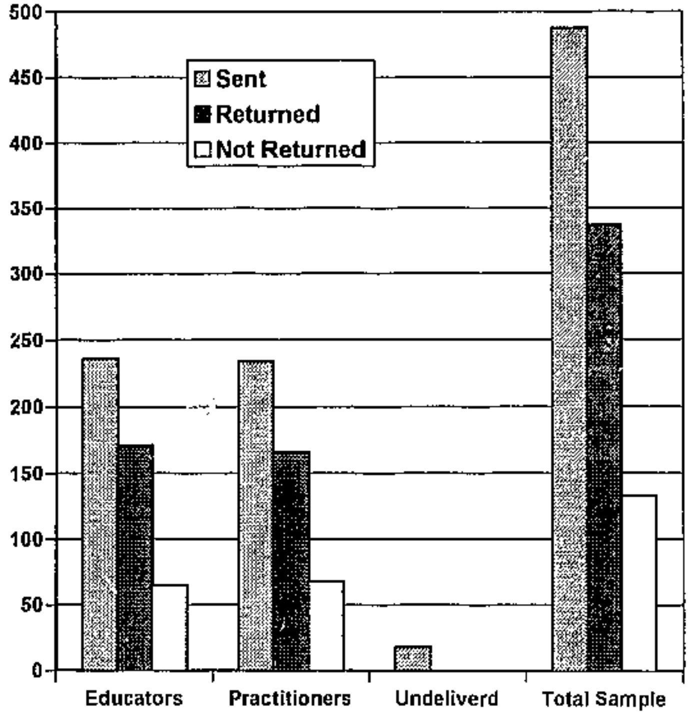


Figure 2

Respondent/ Non- Respondent

Evaluation of Recommended Courses

To make a determination of the importance of the course responses, that is extremely important, a ranking was conducted of all the courses, core, preparatory and electives. To make yet a further study of the differences of the respondents a separate ranking of the educators and practitioners was conducted of all responses using a Likert scale: extremely important four points, important three points, somewhat important two points and not at all important one point. This analysis facilitated the determination of the perceived importance of each course by the respondents. This information, after being ranked, to assure accuracy was entered a third time into a Statistical Analysis System (SAS) at University of Wisconsin Madison, to do comparisons of the respondents.

> The SAS System provides extensive statistical capabilities, Including tools for both specialized and enterprise-wide analytical needs. Research institutes, laboratories, market research firms, universities, pharmaceutical companies, government agencies, banks, and insurance companies can all take advantage of these statistical capabilities. From traditional analysis of variance to exact methods to statistical visualization techniques, the SAS System provides the tools required to analyze data and help your organization make the right decisions. (SAS 2000, June)

Using the SAS system the frequency procedure created a table per item by group. This provided the ordinal categorical ranking distributions per group. Using the educators as the reference distribution one may compare the practitioner's distributions.

Working with the natural ordering that existed, a technique was used that takes advantage of this natural ordering called RIDIT analysis. This procedure compares the actual ranked distributions. The term RIDIT refers to, "relative to an identified distribution." RIDIT analysis, as pointed out by Slavin (1977, p.16), may be more sensitive to the chi-square statistic for comparing two independent samples when the variable under study can be classified into ordered category, such as we have in this study where educators and practitioners are responding to extremely important, important, somewhat important or not at all important.

Using the RIDIT analysis three values were then provided (1) the mean ridit (2) the standard error of the mean ridit and (3) a z-value. The z-value level indicates the level of statistical significance at the $p < .05$. This analysis tested the means to determine if safety educators and safety practitioners differed significantly from each other.

Graphic outputs were also generated using Box-and-Whisker plots of the ranked distributions for each of the items, by sets of core course, preparatory and elective items. This type of graph is useful comparing one variable for several different groups. (Wilson,1999). This technique gives you a quick visual of the distribution of ranks. Additional analysis was conducted to determine whether the respondent was an educator or practitioner and whether the respondent was trained in a technical area. The SAS system was again conducted to determine distribution of ranks for the total population on all course titles.

Response Bias

Using the SAS system, initially a regional bias was assessed, to determine percent of bias by responders to non-responders. Gender was assessed with non-responders and responders creating a table of gender by respondent frequency procedure. Additionally school type for educators and industry type for practitioners was assessed as well as technical group by respondent and non- respondent.

Reliability

To obtain the reliability for the occupational health and safety curriculum analysis all data was collected by one researcher using the same pilot members for all questionnaires. Rank order was completed to assess the reliability. Guilford, (1950, p. 474) stated that reliability is of a certain instrument applied to a certain population. Reliability is again, the extent to which the same measurements of individuals obtained under different conditions yield similar results. "Reliability is a clearer matter. Survey research, by presenting all subjects with a standardized stimulus, goes a long way toward eliminating unreliability in observations made by the researcher." (Babbie 1992 p.279)

Validity

Instrument validity was addressed in the development of the Occupational Health and safety curriculum questionnaire. Validity refers to the degree to which an instrument measures what it is supposed to be measuring. According to Babbie, (1992, p.132), in conventional usage, the term "validity" refers to the extent to which an empirical measure adequately reflects the real meaning of the concept under consideration. These study-employed procedures to address content; construct and face validity.

Content Validity. Content validity refers to the representativeness of the content of the instrument used in the study. The degree to which a measure covers the range of meaning included within the concept (Babbie, 1992, p.133). The construction of the occupational health and safety survey questionnaire addressed the procedures for the concept of content validity. The Delphi technique was used as a method of obtaining judgements from a panel of experts, in this study, the experts were occupational health and safety educators and practitioners. The researcher began by asking open-ended questions to a target group. The next phase used a critical incident technique with the data collected in a semi-structured interview, and from the interview a critical analysis was performed (Polit, 1991 p.280). A Likert scale was used to measure attitudes that involved the summation of the statements to which the respondents were asked to indicate their degree of agreement or disagreement. With this information it allowed an avenue for the researcher to compare the two groups.

Construct validity. Construct validity, as described by Babbie (1992, p. 133), is based on the logical relationships among variables. Construct validity relates to the instrument ability to appear to do what it is intended to do. This calls for a continuing accumulation of information from various sources. Pilot members including safety educators and safety practitioners were asked to review the draft questionnaire to insure understanding and accuracy. The researcher, satisfying the pilot group made requested changes. The way the instrument was constructed using critical incidents, Delphi, Likert type items argues for construct validity too.

Face Validity. The critical incident technique measurement posses the strongest face validity. Face-to-face interviews with prospective pilot members allowed for learning what the members viewed. Face validity was obtained by asking for objective data, regarding existing curriculum in occupational safety and health. This was accomplished by personal interview sessions with pilot group referees.

CHAPTER FOUR

DATA ANALYSIS AND FINDINGS

This chapter presents the analysis of the data concerning the courses needed to determine if an Occupational Safety and Health curriculum could be developed. Through the process of statistical analysis, identifications will be made and conclusions drawn. A combination of descriptive, inferential and non-parametric statistics was used. *Rank-Order*, a non-parametric method was used on the analysis of the questionnaire. Weighting of the rankings was used to determine congruency among practitioners and educators. The chapter is divided into sections, which present different aspects of the study, by core courses, preparatory courses and elective courses. The sections include RIDIT analysis, Box-and-whisker plots, bias analysis, and weighting of the rankings. These sections will include areas of investigation that will address the research questions.

Chi-Square Test

Tests for an association between two categorical variables · non-parametric ·chi- square was to be used in the final analysis to compare individual responses to the whole. The goodness of fit test focuses on the differences between the observed frequencies and the expected frequencies. Hypothesis testing procedure was used comparing results with those that are expected when the null hypothesis is true. The hypothesis test is based upon how close the sample results are to the expected results. Since this research is concerned with the order or ranking of courses, and the possible difference across various conditions or groups, the simple $\chi 2$, distribution of Chi-Square based test is inappropriate for this research data. This analysis looked at the distribution of ranks given to each course based on various conditions. For example, whether the respondent was an educator or a practitioner and whether the respondent was trained in a more technical field.

A frequently employed device is to number the categories from one for the least important to some higher number for the highest importance, and then calculate means and standard deviations and apply a t-test or analyses of variance. This approach has many drawbacks. For one, it is giving the impression of greater accuracy than really exists. For another, the results one gets depend on the particular system of numbers employed. For the aforementioned rationale, this researcher has chosen to use an analysis know as "Relative to an Identified Distribution" (RIDIT) analysis (Bross, 1958, p.18). According to Hanneman, (1996) the **RIDIT** scoring model is a common one that underlies a number of rank-order statistical procedures. This mean RIDIT was used as a substitute measure of relationship, a measure of congruency between the two groupings. The mean RIDIT (Equation 1) was used in place of Spearman Rank correlation coefficient. A measure of significance of how poorly the groups relate to one another is found with the Z-value. As Selvin (1977, p16) stated, RIDIT analysis uses a probability relative to a reference distribution as a means of identifying differences between groups.

<u>Research Question</u>

Will a model safety and health baccalaureate curriculum emerge?

Will safety educators and safety practitioners agree on course offerings?

Ridit Analysis

The RIDIT analysis is basically testing the following hypothesis,

Ho: Distribution of the ranks for reference (educators) group =

Distribution of the ranks for the comparison (practitioners) group.

If the Z-value is less than ± 1.96, then the distribution of ranks is significantly different at the alpha < .05 level.(Anderson, Sweeney, Williams, 1997, p.755).

There exists a problem, of summarizing data and making comparisons among different samples when using data that are ranked or have an ordinal position. Since attempting to quantify the ordinal scales also induces problems, this researcher has decided to work only with the natural ordering that exists. A technique that takes advantage of this natural ordering is the RIDIT analysis. Virtually the only assumption made in RIDIT analysis is that the discrete categories represent intervals of an underlying but unobservable continuous distribution. No assumption is made about normality or any other form for the distribution. To further understand these processes consider the example in Appendix F.

> A good but not well-known statistic for the treatment of ordinal data is ridit analysis. Bross developed ridit analysis in 1985 [Sic](Bross,1958). He chose the name ridit in analogy to probits and logits. The first three letters of ridit stand for relative to an identified distribution. Ridits represent a probability measure relative to any reference distribution as contrasted with probits that are relative to a theoretical normal distribution. Ridit analysis is an appealing technique for treating ordinal data because the reference distribution can be chosen. There are few assumptions to be fulfilled (Sermeus and Delesis, 1996, p.351).

RIDIT analysis was proposed by Bross (1958) and has been applied to the study of automobile accidents (Bross, 1960), cancer (Wynder, Bross, and Hirayama, 1960), and mental illness (Spitzer, et al., 1965). Kantor, Winkelstein, and

Ibrahim (1968) made a mathematical review of RIDIT analysis, and a critique of RIDIT analysis has been conducted by Mantel (1979).

RIDIT analysis begins with the selection of a population to serve as a standard or reference group. In this research, a reference group was arbitrarily selected, for example educators, non-technically trained individuals, and so forth. RIDIT analysis, as pointed out by Selvin (1977, p.16), "may be more sensitive to the chi-square statistic for comparing two independent samples when the variable under study can be classified into an ordered category."

The mean RIDIT for the comparison group is simply the sum of the products of the observed frequencies times the corresponding RIDIT weights, divided by the total frequency (n_1). (see Appendix F and Equation 1).

$$\bar{r} = \sum_{i=1}^{k} r_i Y_i \tag{1}$$

The standard error of the mean for the comparison group is given by Equation 2.

$$s.e.(\bar{r}) = \frac{1}{2\sqrt{3}n_2}\sqrt{1 + \frac{n_2+1}{n_1} + \frac{1}{n_1(n_1+n_2-1)} - \frac{\sum(n_{1j}+n_{2j})^3}{n_1(n_1+n_2)(n_1+n_2-1)}} \tag{2}$$

A test of significance of the difference between the obtained mean RIDIT and the standard value of 0.50 may be given as in Equation 3.

$$Z = \frac{\bar{r} - .5}{s.e.(\bar{r})} \tag{3}$$

The mean RIDIT for the comparison group is interpreted as follows. If the mean RIDIT is greater than 0.50, then more than half of the time a randomly selected subject from the comparison group will have placed a higher importance on ranking a course than a randomly selected subject from the reference group. For example, if the mean RIDIT for the comparison group is r = 0.567, with se(r) = 0.019, and Z = 3.36, then the comparison group's distribution on ranking was significantly higher than the reference group. Using educators as the reference distribution one may compare the practitioner's distribution. If the mean RIDIT for a comparison group is greater than 0.50 then educators tended to rank the item less important than practitioners. The RIDIT procedure compares the actual ranked distributions. If the mean RIDIT was less than 0.50 then practitioners tended to rank the item less important than educators.

> The RIDIT of a comparison group gives a probability that a randomly selected individual from that group has a higher score than a randomly selected individual from the reference group. The RIDIT of the reference group itself is, by definition, .500 (Sermeus and Delesis,1996, p.351).

The Z-values indicates the level of statistical significance in the mean RIDITS. If the Z-value is greater than ± 1.96 then the distribution of ranks is significantly different at the alpha <0.05 level. Here we use the example for Core item 2, as shown in Table 4, with the educators being the reference group one can say the practitioners tended to significantly rank (Z -2.467) (p<.05) Fundamentals of Industrial Hygiene and Toxicology less important than educators (see Table 3).

Core Courses

Table 3

Core Course Titles by Reference Number

1	Principles of Occupational Safety & Health
2	Fundamentals of Industrial Hygiene and Toxicology
3	Safety and Health Program Management
4	Psychological Aspects of Safety and Health
5	Analysis and Design For Safety
6	Methodology for Safety Training
7	Experiential Occupational Safety & Health Learning
8	Legal Aspects of Occupational Safety and Health
9	Fire Prevention/ Protection and Control
10	Ergonomics/ Human Factors Engineering
11	System Safety Analysis
12	Product Safety
13	Safe Handling of Materials

Table 4

Core Course RIDIT Analysis Ranking Distribution

Core Course	Mean RIDIT	Standard Error of the Mean RIDIT	Z-value	Probability
1	0.494	0.022	-0.239	>.05
2	0.444	0.022	-2.467	<.05
3	0.487	0.022	-0.567	>.05
4	0.495	0.022	-0.216	>.05
5	0.510	0.022	0.477	>.05
6	0.511	0.022	0.586	>.05
7	0.465	0.022	-1.540	>.05
8	0.421	0.022	-3.510	<.05
9	0.476	0.022	-1.050	>.05
10	0.476	0.022	-1.070	>.05
11	0.478	0.022	-0.939	>.05
12	0.514	0.022	0.664	>.05
13	0.509	0.022	0.415	>.05

Examining core course eight, in Table 4 RIDIT Analysis, Legal Aspects of Occupational Safety and Health, the practitioners tended to significantly rank ($Z - 3.510$) ($p < .05$) less important than educators. One can look at this in further detail by reviewing Appendix H, reading the core courses, a table per item by group, educators denoted by (0), practitioners denoted by (1). This provides the ordinal categorical ranking distributions per group. As a measure of the topics perceived importance to responses, codes were applied to responses. Extremely important assigned a value of (4), important (3), somewhat important (2) and not at all important a value of (1), as depicted in table 5.

Table 5

Distribution of Ranks

4	Extremely Important
3	Important
2	Somewhat Important
1	Not at All Important

First let us examine course (2), Fundamentals of Industrial Hygiene and Toxicology. Educators (0) being used as the reference distribution, one may compare the practitioner's (1) distribution. By referencing table 5 to interpret the scale value, that is 4 = extremely important. From the total sample 68% educators responding ranked the course extremely important compared to 57% practitioners. Of the 212 total sample responding extremely important 55.2% were educators compared to 44.8% practitioners. From the total sample core course eight, Legal Aspects of Occupational Safety and Health, educators (0) as the reference distribution comparing the distribution of practitioners (1), there were 52 % educators ranking this course extremely important compared to 39% practitioners. Of the 154 responding extremely important, 57.79%, were educators compared to 42.21% practitioners (as illustrated in Appendix H).

In further detail viewing table 4, RIDIT Analysis, it can be seen there is no level of statistical significance in the mean RIDITS for the remainder of the core courses. There is a level of congruency between the educators and practitioners' responses with the remaining core courses, that is the z-value is ± 1.96.

The courses include:

Principles of Occupational Safety and Health (1)

Safety and Health Program Management (3)

Psychological Aspects of Safety and Health (4)

Analysis and Design for Safety and Health (5)

Methodology for Safety Training (6)

Experiential Occupational Safety and Health Learning (7)

Fire Prevention/Protection and Control (9)

Ergonomics/Human factors Engineering (10)

System Safety Analysis (11)

Product Safety (12)

Safe Handling of Materials (13)

Box-and-Whisker Plot

A box-and-whisker plot can be useful for handling many data values. They allow people to explore data and to draw informal conclusions when two or more variables are present. It shows only certain statistics rather than all the data. *Five-number summary* is another name for the visual representations of the box-and-whisker plot. The five-number summary consists of the median, the quartiles, and the smallest and greatest values in the distribution. Immediate visuals of a box-and-whisker plot are the center, the spread, and the overall range of distribution (Nord 1995).

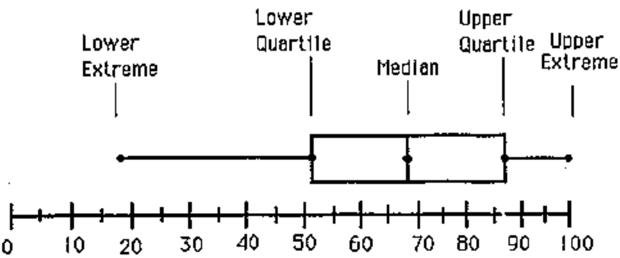


Figure 5

Box-and-Whisker Plot

The Box-n-Whisker Plot is good at showing the extreme values and the range of middle values of your data. The box shows us the middle values of a variable, while the whiskers stretch to the greatest and lowest value of that variable.

The Box-n-Whisker plot was invented in the 1970's by John Tukey....

This type of graph is useful comparing one variable for several different groups. A box plot of that variable can be drawn for each group on one page, giving you a visual representation of the differences of that variable according to group. For example: The poverty rate of different countries might be compared by looking at the box-n-whisker for that country in relation to the box-n-whisker graph of the poverty rates of the other countries.

It is sometimes called the Five-number summary, because it uses five summary statistics for a certain variable. These summary statistics are

median
 the middle of the data when it is arranged in order from least to greatest, think of splitting the data into two equal groups.
lower quartile or 25 th percentile
 the median of the lower half of the data
upper quartile or 75 th percentile
 the median of the upper half of the data
minimum value
 the smallest observation value
maximum value
 the largest observation value

- the Box portion of the Box-n-Whisker plot includes 50 % of the data
- the whiskers extend to the minimum and maximum data values
- more than one box plot can be drawn for the number scale allowing comparison of variable by groups (Wilson 1999).

The box-and-whisker plot analysis summarizes a set of univariate observations. When interpreting a box-and-whisker plot, you can acquire a lot of information swiftly. Box-and-whisker plots were generated from the total sample of the ranked distributions for each of the items, by sets of core, preparatory and elective items. According to Dorner (1997) the location of the median line and the relative length of the whiskers help indicate how symmetrical the data are. When the median lies far from the center of the box or if one whisker is much longer than the other is, you know that the distribution is skewed to some extent.

Reading the box-and-whisker plot for core courses in figure 4, referencing the distributions of ranks as not at all important (1), somewhat important (2), important (3) and extremely important (4). The highest median rank distribution of four, (4) is for core course one, two, three and ten respectively.

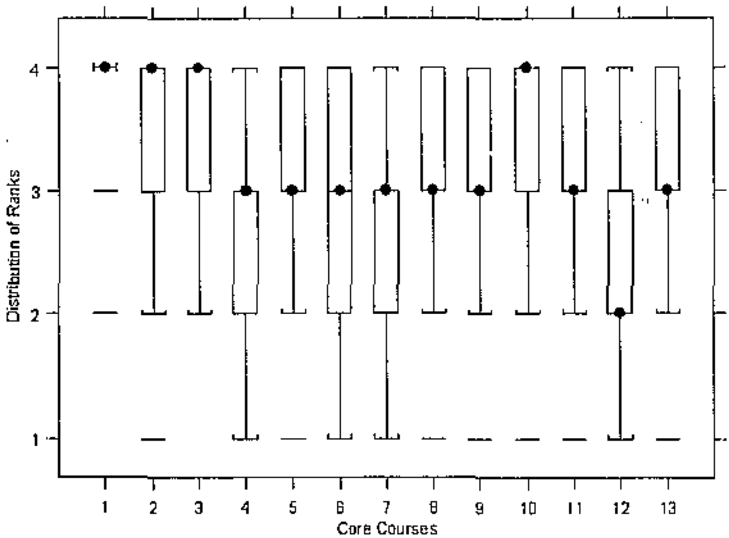


Figure 4

Core Courses Total Sample Population

The highest median rank core course as viewed in figure 4 include:

- 1, Principles of Occupational Safety & Health
- 2, Fundamentals of Industrial Hygiene and Toxicology
- 3, Safety and Health Program Management and
- 10, Ergonomics/Human Factors Engineering.

The lowest overall median ranked was course twelve.

- 12, Product Safety

Referencing the mean RIDIT in table 4 one can see the core courses with the highest rank, in figure 4, with the least amount of variability, more congruency, was for core course (1), Principles of Occupational Safety and Health (0.494). This is followed by courses (3), Safety and Health Program Management (0.487) then (10), Ergonomics/ Human Factors Engineering (0.476) and (2), Fundamentals of Industrial Hygiene and Toxicology (0.444).

The frequency procedure created by the Statistical Computing System (SAS) demonstrates the distribution of ranks for the total sample population in detail in Appendix G. This analysis will reveal core course with the highest frequency distribution, one Principles of Occupational Safety & Health 83.69%, two Fundamentals of Industrial Hygiene and Toxicology 62.91%, three Safety and Health Program Management 66.17% and ten Ergonomics/Human Factors Engineering 50.45%, as depicted on the whisker plot analysis in figure four.

The core courses with a median rank of three, distribution of ranks skewed toward the higher end making them next in importance are:

- 5, Analysis and Design For Safety
- 8, Legal Aspects of Occupational Safety and Health
- 9, Fire Prevention/Protection and Control and
- 11, System Safety Analysis
- 13, Safe Handling of Materials
- 6, Methodology for Safety Training

As was discussed earlier with the RIDIT analysis for course (8) Legal Aspects of Occupational Safety and Health, although at a high ranking, the mean RIDIT is not the best, (0.421), some individuals did not agree with this ranking.

Continuing core courses being skewed toward the lower end, of the whisker plot (4), Psychological Aspects of Safety and Health, (7), Experiential Occupational Safety & Health Learning and (12) Product Safety the lowest median ranked course. Reviewing these lower ranked courses of the distribution between educators and practitioners in Appendix H. Further breakdown one can see 24% of the sample responded extremely important to core course (4) Psychological Aspects of Safety and Health. Another 26% responded somewhat important with 1% responding not at all important. Of the 167 responding important 27% educators responded important with 23% practitioners responding important. Indicating although this course ranked lower on the whisker plot 50% of the sample viewed the course important.

Core course (7) Experiential Occupational Safety & Health Learning 25% of the 170 educators ranked this course extremely important with one educator not responding. The 166 responding practitioners 20% ranked Experiential Occupational Safety & Health Learning extremely important. Of the educator group, 6% ranked Experiential Occupational Safety & Health Learning not at all important with 9% practitioners ranking not at all important.

Product Safety with the lowest median rank score, of the 337 responding 11% ranked this course extremely important. Of the 159 responding somewhat important 50% were educators and 49% practitioners, one practitioner responding not at all important. This would suggest the educator group and practitioners group agrees on the ranking.

Preparatory Courses

Reviewing the RIDIT analysis for the preparatory courses, reference table 6 for titles.

Table 6

Preparatory Course Titles by Reference Number

1	Computer Applications
2	Chemistry with Laboratory and Including Organic
3	Principles of Statistics
4	Human Anatomy and Physiology
5	Principles of Physics with Laboratory

The mean RIDIT less than 0.50 indicate that the educators tended to rank all of the preparatory courses higher than the practitioners. The Z-value shows a significant difference between the two groups where practitioners tended to rank all the preparatory courses lower than the educators.

Table 7

Preparatory Course RIDIT Analysis Ranking Distribution

Prep	The Mean RIDIT	Standard Error of the Mean RIDIT	Z-value	Probability
1	0.429	0.022	-3.150	<.05
2	0.397	0.022	-4.550	<.05
3	0.408	0.022	-4.090	<.05
4	0.443	0.022	-2.500	<.05
5	0.446	0.022	-2.360	<.05

Viewing the data in Appendix I, will give a closer look at the non-congruency in preparatory course two, Chemistry with Laboratory and Including Organic, with a Z- value of -4.550. Of the one hundred respondents ranking this item extremely important 64 % were educators compared to 36% practitioners. Practitioners do not view a course in Chemistry with Laboratory and Including Organic as important as educators. This is followed by preparatory courses:

- (3) Principles of Statistics
- (1) Computer Applications
- (4) Human Anatomy and Physiology and
- (5) Principles of Physics with Laboratory.

Repeatedly practitioners tend to rank the preparatory courses lower than educators.

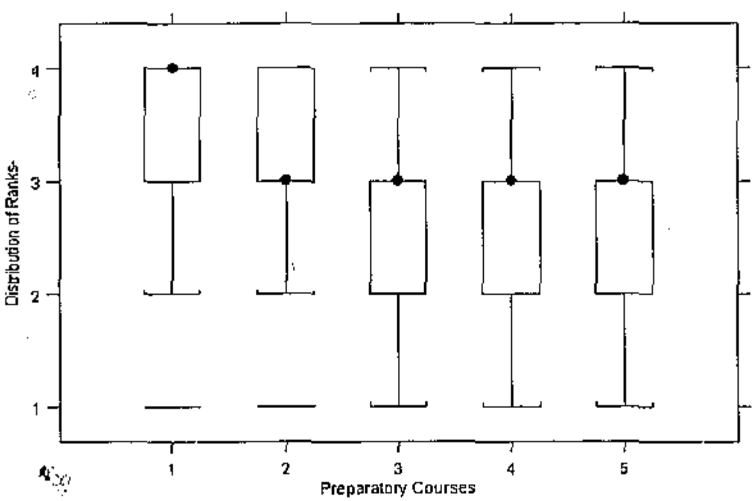


Figure 5

Preparatory Courses Total Population

Examining the box-and-whisker plot in figure 5 one can observe the overall median rank distribution from the total population. Evaluating the preparatory courses the following analysis can be drawn from figure 5.

The overall highest median rank for the total population sequence is:

- (1) Computer Applications
- (2) Chemistry with Laboratory and Including Organic
- (3) Principles of Statistics
- (4) Human Anatomy and Physiology
- (5) Principles of Physics with Laboratory.

Course two, distribution of ranks is skewed toward the higher end making it more important compared to course three (3), four (4) and five (5).

Although practitioners significantly ranked course (1) Computer Applications Lower (0.429 Z -3.150) it nevertheless has a higher overall median rank for the total population. One can review Appendix G, the Statistical Analysis System (SAS) distribution of ranks to find 30% of the total sample population ranked Computer Applications extremely important. Reviewing Appendix I, SAS system frequency procedure, 44% of the 165 responding practitioners ranked Computer Applications important while 45% ranked it extremely important. Principles of Statistics course (3), 50.6% of the 166 practitioners responding ranked this course important. Educators ranked Principles of Statistics similar, of the 171 responding 48% responded important. Preparatory Course (4) Human Anatomy and Physiology 41% of the 166 practitioners responding ranked this course important compared to educators at 45%. Principles of Physics with Laboratory course (5)

43% of the practitioners responded important compared to 36% educators responding important. Of the 171 educators 25% responded extremely important to Principles of Physics with Laboratory whereas merely 14% practitioners responded extremely important.

Electives Courses

A review of the RIDIT analysis in table 8, elective courses, will find the following courses where educators tended to rank the item *more* important. The mean RIDIT is less than 0.50 (3) Technical Writing, (7) Research Methods (12) Elements of Environmental Safety and Health, (20) Writing skills Including Rhetoric & Composition, (21) Construction Safety, (22) Motor Fleet and Transportation Safety, (23) Introduction to Security and (24) Epidemiology.

Practitioners tended to rank the following electives *more* important. The mean RIDIT is less than 0.50 (1) Techniques of Business Management and Business Economics. The remaining list follows in order with: (2) Logic (4) Measurement of Safety Program Performance; (5) Facilitating Skills; (8) Time Management; (9) Operating or Manufacturing Processes and Materials; (10) Financial Skills; (11) Chemical Safety; (13) Labor Relations; (14) Quality Assurance; (15) Foreign Language; (16) Introduction to Computer Aided Design;(17) Ethics of Safety; (18) Fundamentals of Public Speaking; (19) Business Mathematics; and (25) Electrical/Mechanical Fundamentals.

The z-value shows a significant difference between the two groups in eleven of the elective courses. The courses with a level of statistical significance, non-congruency, are courses:

- ✓ 1, Techniques of Business Management and Business Economics
- ✓ 2, Logic
- ✓ 3, Technical Writing
- ✓ 5, Facilitating Skills
- ✓ 7, Research Methods
- ✓ 8, Time Management
- ✓ 9, Operating or Manufacturing Processes and Materials
- ✓ 10, Financial Skills
- ✓ 12, Elements of Environmental Safety and Health and
- ✓ 24, Epidemiology.

Electrical/Mechanical Fundamentals, course 25, has a marginal significance at a z-value of 1.98, practitioners tended to rank the course higher.

The z-value in table 8 indicates the level of statistical significance in the mean RIDITS. When z <-1.96 or > 1.96 shows how poorly the two groups relate to one another.

Table 8

Electives Course RIDIT Analysis Ranking Distribution

Elective	The Mean RIDIT	Standard Error of the Mean RIDIT	Z-value	Probability
1	0.631	0.022	5.860	<.05
2	0.587	0.022	3.900	<.05
3	0.392	0.022	-4.800	<.05
4	0.542	0.022	1.890	>.05
5	0.643	0.022	6.410	<.05
6	0.534	0.022	1.520	>.05
7	0.403	0.022	-4.320	<.05
8	0.623	0.022	5.510	<.05
9	0.577	0.022	3.440	<.05
10	0.592	0.022	4.110	<.05
11	0.502	0.022	0.130	>.05
12	0.431	0.022	-3.090	<.05
13	0.531	0.022	1.420	>.05
14	0.508	0.022	0.377	>.05
15	0.516	0.022	0.725	>.05
16	0.518	0.022	0.805	>.05
17	0.514	0.022	0.647	>.05
18	0.514	0.022	0.632	>.05
19	0.524	0.022	1.070	>.05
20	0.475	0.022	-1.100	>.05
21	0.460	0.022	-1.740	>.05
22	0.485	0.022	-0.660	>.05
23	0.496	0.022	-0.158	>.05
24	0.417	0.022	-3.660	<.05
25	0.544	0.022	1.980	>.05

Table 9

Elective Course Titles by Reference Number

1	Techniques of Business Management & Business Economics
2	Logic
3	Technical Writing
4	Measurement of Safety Program Performance
5	Facilitating Skills
6	Risk Management Loss Prevention/ Control
7	Research Methods
8	Time Management
9	Operating or Manufacturing Processes and Materials
10	Financial Skills
11	Chemical Safety
12	Elements of Environmental Safety And Health
13	Labor Relations
14	Quality Assurance
15	Foreign Language
16	Introduction to Computer Aided Design
17	Ethics of Safety
18	Fundamentals of Public Speaking
19	Business Mathematics
20	Writing Skills Including Rhetoric & Composition
21	Construction Safety
22	Motor Fleet and Transportation Safety
23	Introduction to Security
24	Epidemiology
25	Electrical/ Mechanical Fundamentals

Elective courses with the z-value showing a significant difference between the two groups, educators tended to rank the following elective courses *more* important:

- 3, Technical Writing
- 7, Research Methods
- 12, Elements of Environmental Safety And Health
- 24, Epidemiology

There appears to be congruency from the responding educators and practitioners with the remaining electives, the courses with congruence are:

(4) Measurement of Safety Program Performance

6) Risk Management Loss Prevention/ Control,

(11) Chemical Safety

(13) Labor Relations

(14) Quality Assurance

(15) Foreign Language

(16) Introduction to Computer Aided Design

(17) Ethics of Safety

(18) Fundamentals of Public Speaking

(19) Business Mathematics

(20) Writing Skills Including Rhetoric & Composition

(21) Construction Safety

(22) Motor Fleet and Transportation Safety

(23) Introduction to Security

(25) Electrical / Mechanical Fundamentals.

Examining Appendix J, table of electives per item by group, this analysis may be evaluated in more detail. Observe the elective course (1) Techniques of Business Management and Business Economics it is apparent that practitioners ranked this course more important than did educators. Eighty-two (82) respondents considered this course to be extremely important. More than half of these respondents 69.5% were practitioners while only 30.5% were educators. It should, also, be noted that more practitioners responded to elective course one than did educators. From the total sample responding to this course, 34.3% were practitioners compared to 14.69% of educators. Fourteen (14) educators out of 171 ranked this course to be not at all important. It is readily discernible that there is only a negligible amount of agreement of those responding to the importance of this course.

Practitioners responded much more favorably to Financial Skills, item 10, than did educators. Practitioners deemed it to be over twice as important as did educators. Practitioners ranked Financial Skills at level of 70.59% of importance compared to a 29.41% for educators. Utilizing the entire sample of educators responding to financial skills 53% ranked it somewhat important compared to a 44% ranking by practitioners. Seventeen (17) educators out of the 171 regarded Financial Skills not at all important. In an overall ranking of Financial Skills, practitioners ranked it more important than educators.

Course twelve (12) Elements of Environmental Safety and Health was ranked extremely important by more educators than by practitioners. Out of 119 responders, 59.6% of educators concluded this course was extremely important 40.34% of practitoners agreed. In the total sample, 35% believed this course to be extremely important and yet 1.19% thought it not at all important.

Evaluating the whisker plot in figure 6 ranking of elective courses for the total population the majority of the electives were ranked similarly at a median of three.

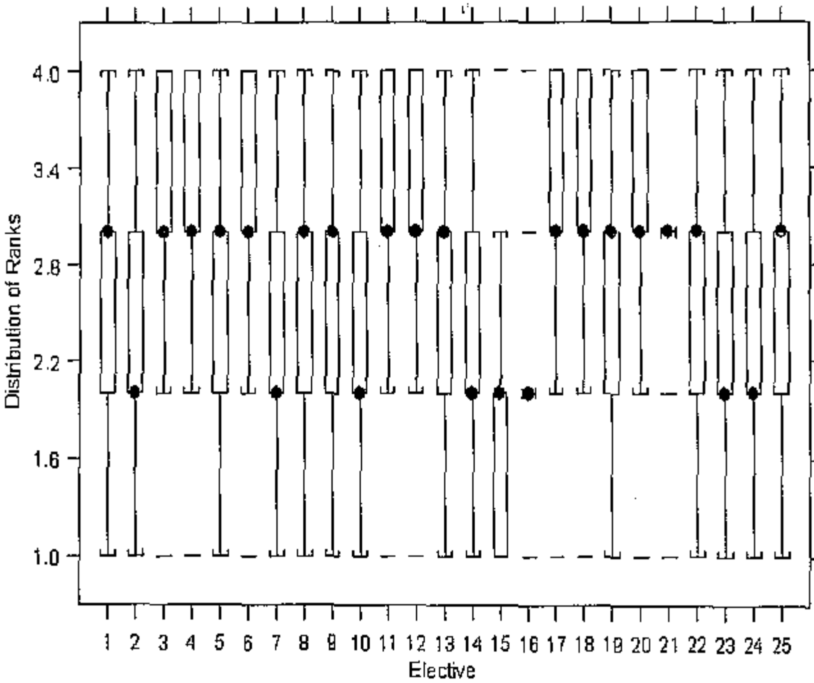


Figure 6

Elective Courses Total Sample Population

Some courses were consistently ranked lower, by the total population including:

- (2) Logic
- (7) Research Methods
- (10) Financial Skills
- (14) Quality Assurance

- (15) Foreign Language
- (16) Introduction to Computer Aided Design
- (23) Introduction to Security and
- (24) Epidemiology

Reviewing the lower ranked elective courses in Appendix (G), 52 % of the population ranked Logic somewhat important while 10% ranked it not at all important. Educators ranking Logic lower than practitioners, with 7% educators and 3% practitioners ranking not at all important. Research Methods 45.9% of all respondents ranked somewhat important with 7.4% ranking not at all important. Educators ranked this course more important than practitioners. For example 47% of educators compared to 25% practitioners ranked it important. Over half of the total sample population ranked Financial Skills, Quality Assurance, Foreign Language, Introduction to Computer Aided Design, Introduction to Security and Epidemiology as somewhat or not at all important.

<u>Technical/Non -Technical</u>

This analysis considered the distribution of ranks given to each course based on various conditions. For example, whether the respondent was an educator or a practitioner, and whether the respondent was trained in a more technical field of study. The technically trained respondents were someone having to do with the practical, industrial, or mechanical arts or the applied sciences; for example engineering, technicians and so forth. The non-technical were considered having to do with the administration of a function, such as managing, directing, supervising and so forth.

The box-and-whisker plot in figure 7 displays the technically trained versus non-technical trained responders. The first three core courses were ranked similarly and the highest, except for course (10) Ergonomics/Human Factors Engineering,

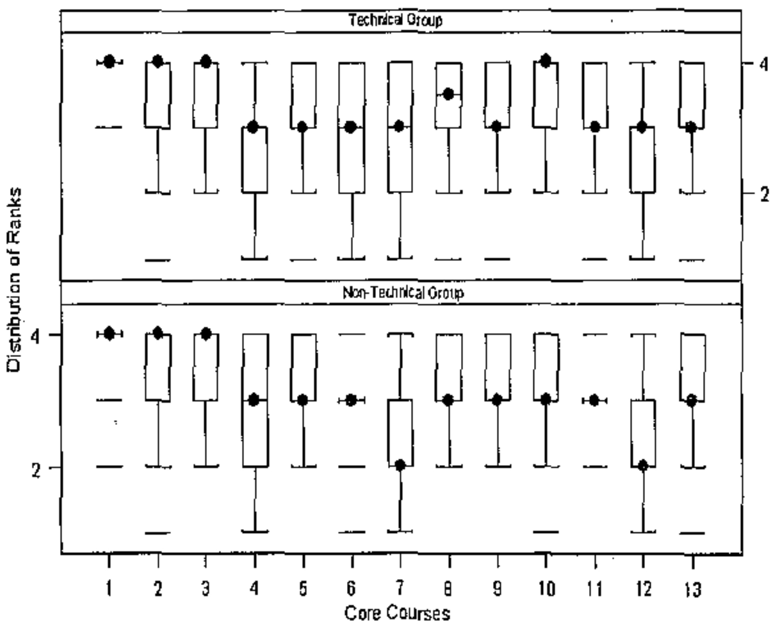


Figure 7

Technical Non-Technical Total Sample Population

where the technical responders ranked it higher than the non-technical responders. Major differences may be noticed in the ranking of course (8) Legal Aspects of Occupational Safety and Health, (10) Ergonomics/Human Factors Engineering and

(12) Product Safety, with these courses being ranked *more* important for the technical group than the non-technical group.

Reviewing the courses will reveal course seven, eight and eleven with a statistical significance, technical group ranked more important. Core Course (7) Experiential Occupational Health & Safety Learning has a median rank of two for the non-technical group. The technical group ranked course seven significantly *more* important, z-3.43, and a median rank of three. The technical group included 25% ranking extremely important yet another 6.7% ranked not at all important. The non-technical group revealed 18 % ranking core course (7) Experiential Occupational Health & Safety Learning extremely important. From the non-technical educator group 10% ranked Occupational Health and Safety Learning extremely important compared to 19% practitioners. From the technical group 26% educators ranked Occupational Health and Safety Learning extremely important compared to 24% practitioners.

There was 8% of the total sample that responded not at all important to Occupational Health and Safety Learning. This was evenly distributed between educators and practitioners responses. Course (8) Legal Aspects of Occupational Safety and Health the technical group ranked significantly more important with a Z value of z-3.36. Of the 151 responders responding extremely important 69.5% were technical and 30.5% were non-technical. The technical groups more than doubled the rank of extremely important compared to the non-technical group for core course eight. From the technical group 78% educators responded extremely important to core course eight compared to 22% practitioners. The non-technical group that responded extremely important included 9% educators and 91%

practitioners. Core course (11) System Safety Analysis the technical group ranked more important, z- 2.08 but not real strong. The remaining courses did not reveal any statistical significance between groups. Course (12) Product Safety will be analyzed due to being the lowest ranked course on the whisker plot with the technical group ranked higher. From the total sample 7.2% responded extremely important for the technical group compared to 3.9% of the non-technical group. Again from the total sample, 24.4% of the technical group ranked course 12 important compared to the non-technical group at 13.35%. Responding somewhat important, for course12, in the technical group was 28.6% compared to 18.9% for the non-technical. The responding technical group for course 12, to not at all important was 3% compared to 6% of the non-technical group. Figure 8 shows the

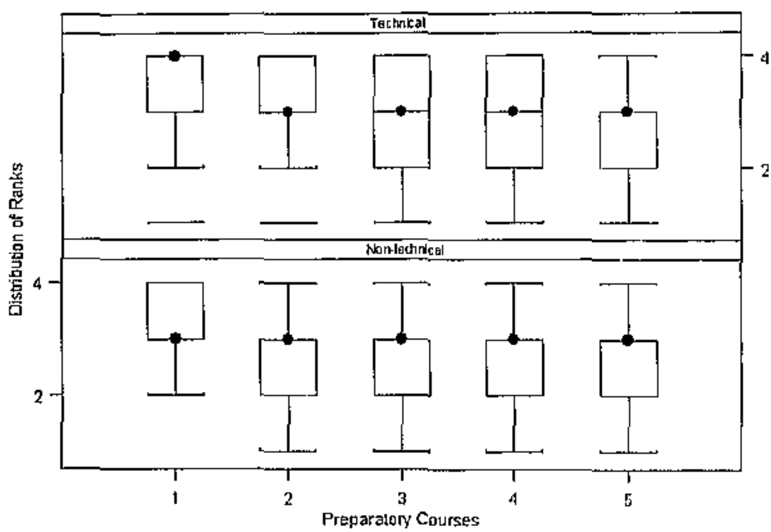


Figure 8

Technical Non -Technical Group Total Population

technical group's median rank of four on preparatory course (1), Computer Applications was higher compared to a median rank of three for the non-technical group, although both distributions were skewed in opposite directions. All other courses maintained similar median ranks, with the technical group distributing generally higher rankings than the non-technical group on all courses except course (5), Principles of Physics with Laboratory.

There was only one elective ranked on average at *more* important by the technical group, course (3) Technical Writing had a median rank of four.

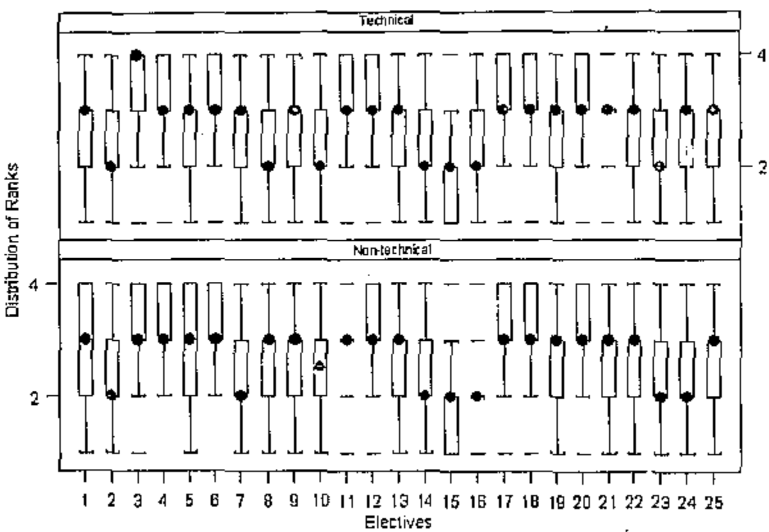


Figure 9

Technical Non-Technical Group Total Sample Population

The majority of distribution ranks were similar for all course across the technical and non-technical groups, as illustrated in figure 9.

Bias Analysis

To check for possible bias based on non-respondents an analysis comparing respondents to non-respondents was conducted. Initially, a regional bias was assessed, as seen in figure 10. The relative percent of non-responders to responders was assessed, with differential amounts of non-responders across regional areas as indicative of the possibility of bias. Generally, for the educators, the non-responder proportions were fairly similar, with regions 3 and 9 providing the highest proportion of non-responders.

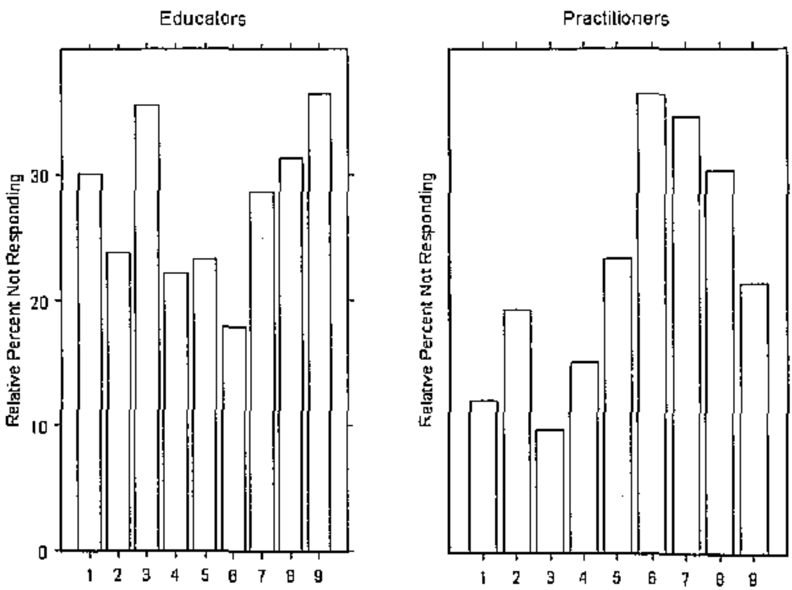


Figure 10

Non-Responders by Region

Appendix L may be referenced for regional definitions. For the practitioners, there seemed to be higher proportions of non-responders in regions 6, 7, and 8. Figure 11, is a representation of the total sample with the responses of practitioners (P) and educators (E) per region.

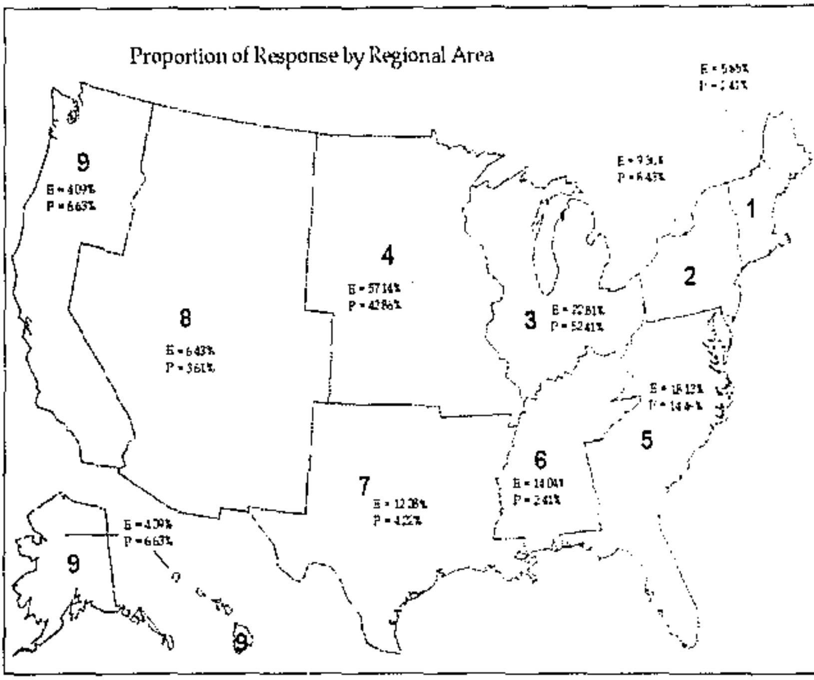


Figure 11

Total Sample Population Response by Region Area

Reviewing figure 12, gender non-responding and referencing appendix L, 44% of the female practitioners did not respond, compared to 26 % of male practitioners not responding. This is significant difference not responding with a z value of z - 2.21. From the total sample of practitioners 15% were female compared to 85% male responders. There appears to be fewer non-responders for males and females for the educator group but a disproportionate value for practitioners, as depicted in figure 12. Perhaps this is due to a less proportion of females in the total sample of practitioners surveyed.

Returning to the SAS system frequency procedure table in Appendix L, note there is no significance difference in educators by gender not responding z value is z- 1.98

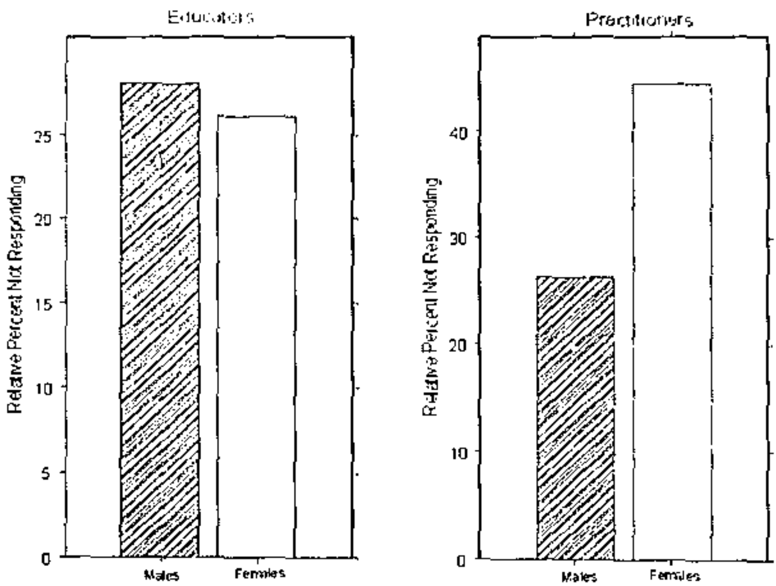


Figure 12

Gender Non-Responding

From the educator group 28% did not respond compared to 26% females not responding. There were equal proportions of educators' male and female responding at 72% and 74% respectively.

One may notice a disproportionate non-responder percent across school-types for educators and industrial type for practitioners. Examining figure 13 school-types include (71) schools of health sciences, (72) education, (73) engineering and technology and (74) business. Industries surveyed included (91) manufacturing, (92) institutional, such as schools, government, hospitals and so forth (93) utilities and (94) consulting, including insurance.

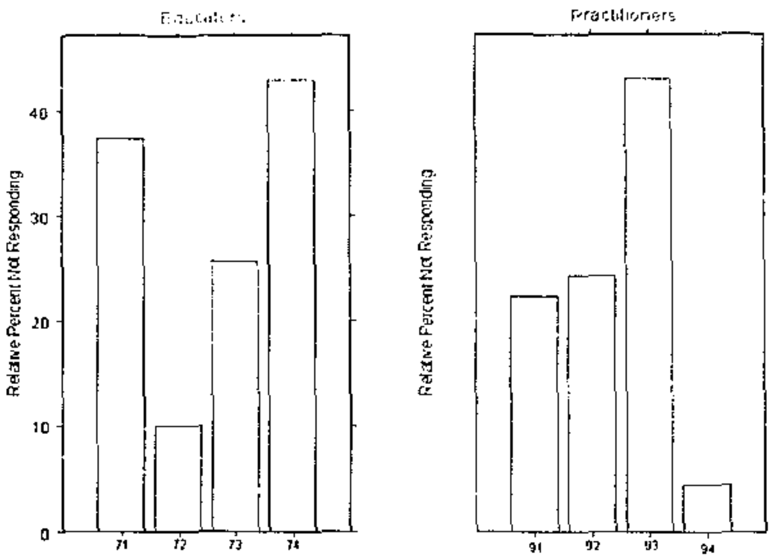


Figure 13

Non-responders School / Industrial Type

Business School type (74) at 42.8% was the highest non-responder educator percentage compared to responders. This may be due to most safety and health programs were being housed in education, health and science or engineering and technology schools. Utility (93), industry type for practitioners was the highest non-responder percentage. Few of those surveyed, 2%, were from the utilities industry.

Non-responder percents were similar for educators program-type and practitioners type position, as seen in figure 14 (see Appendix M).

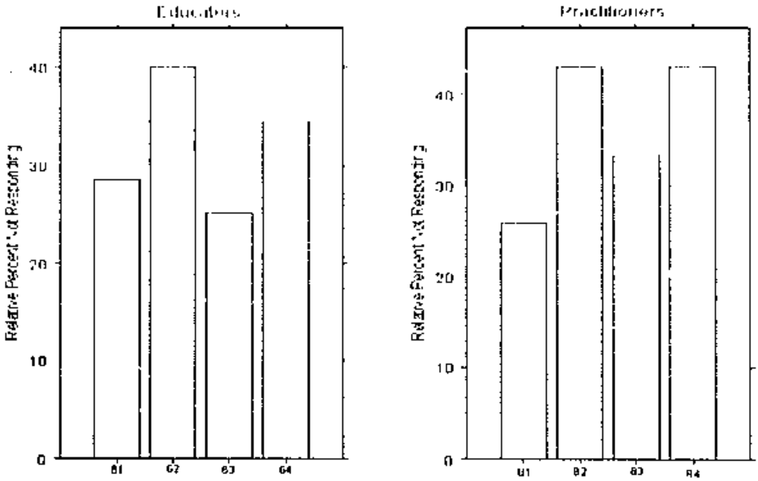


Figure 14

Non-respondent program / position type

Educator highest rate non- responding at 40% was program type (62) construction. Construction was followed with (64) Hygiene/Environmental program (61) Safety and Health Management and (63) Technical/Engineering. From the educators total sample 5% was from construction type programs. The educators non-responders compared to responders were very similar in each program type. Practitioners' highest rate non- responding at 42% was position type (82) Construction. (84) Hygiene /Environmental position (83) Technical/Engineering and (81) Safety and Health Management followed Construction. As with the educators, the practitioners' non-responder compared to responders was very similar in each position type.

Weighting of the Rankings

In the previous whisker plot and RIDIT analysis there were highly congruent responses that may rank very low. If there was a high ranking (median ranked position) and the mean RIDIT is not the best, then it says that although the overall ranking was generally high, some individuals did not agree with this. Therefore this researcher has taken this one step further and the following rule was established:

1. If a high congruency is obtained (mean RIDIT near 0.50)

   and

2. High median ranked position

Then not only is their information indicating the overall ranked position of the course, but also high congruency among educators and practitioners. Based on this approach multiplicative weightings was done using the following formula.

Weights = absolute value

(Rank position of whisker plot – Rank position of RIDIT) + 1 (4)

Weighted value = (Rank position of whisker plot * Weight) (5)

This approach takes both the ranking and congruency into consideration.

Therefore, looking at table 10, the weighting scheme weights the position of the original ranked position with level of congruency.

Table 10

Core Course Weighted Value

Rank Position	Rank Whisker Course Number	Rank RIDIT Course Number	Weight	Weighted Value	New Rank
1	1	12	6	6	1
2	2	6	11	22	6
3	3	5	5	15	3.5
4	10	13	7	28	8
5	5	4	3	15	3.5
6	8	1	8	48	9
7	9	3	3	21	5
8	11	11	1	8	2
9	13	9	6	54	10
10	6	10	9	90	12
11	4	7	7	77	11
12	7	2	2	24	7
13	12	8	13	169	13

Postulated on this new ranking one could say the highest core course ranked is course one Principles of Occupational Safety and Health. This course was followed with course eleven System Safety Analysis, course three Safety and Health Program Management and course five Analysis and Design for Safety are tied for third. Therefore each is ranked 3.5 based on tied ranks in non-parametric statistics. With the new ranked position the remaining follow in order. Fire Prevention/Protection and Control; Fundamentals of Industrial Hygiene and Toxicology; Experiential Occupational Safety and Health Learning; Ergonomics/Human Factors Engineering; Legal Aspects of Occupational Safety and Health; Safe Handling of Materials; Psychological Aspects of Safety and Health; Methodology for Safety Training and ranked last is Product Safety.

The same, weighted, process was continued for the remainder of the courses.

Table 11

Preparatory Course Weighted Value

Rank Position	Rank Whisker Course Number	Rank RIDIT Course Number	Weight	Weighted Value	New Rank
1	1	5	3	3	1
2	2	4	4	8	3
3	3	1	2	6	2
4	4	3	3	12	4
5	5	2	5	25	5

The preparatory courses Computer Applications ranked highest followed by Principles of Statistics, as seen in table 11. Chemistry with Laboratory and including Organic is ranked third followed by, Human Anatomy and Physiology and Principles of Physics with Laboratory ranked last.

Continuing with the electives and weighted process, the rank was determined as depicted in table 12. Measurement of Safety Program Performance is the highest ranked elective, of the weighted scheme. Followed by Risk Management Loss Prevention/Control, Technical Writing and Epidemiology. Ethics of Safety, Chemical Safety, Fundamentals of Public Speaking and Motor Fleet and Transportation Safety are ranked next. Followed by Labor Relations and Business

Mathematics. Techniques of Business Management & Business Economics are tied for eleventh with Elements of Environmental Safety and Health.

Table 12

Elective Course Weighted Value

Rank Position	Rank Whisker Course Number	Rank RIDIT Course Number	Weight	Weighted Value	New Rank
1	3	5	25	25	3
2	4	1	7	14	1
3	6	8	7	21	2
4	11	10	14	56	6
5	12	2	18	90	11.5
6	17	9	9	54	5
7	18	25	9	63	7
8	20	4	13	104	13.5
9	21	6	13	117	16
10	1	13	9	90	11.5
11	5	19	11	121	18
12	8	16	10	120	17
13	9	15	8	104	13.5
14	13	17	5	70	9
15	19	18	5	75	10
16	22	14	4	64	8
17	25	11	11	187	21
18	2	23	14	252	22
19	7	22	6	114	15
20	10	20	17	340	25
21	14	21	6	126	19
22	24	12	2	44	4
23	23	24	6	138	20
24	16	7	13	312	23
25	15	3	13	325	24

Writing Skills Including Rhetoric and Composition along with Operating or Manufacturing Processes and Materials were tied for thirteenth. Next rank is Research Methods, Construction Safety, Time Management, Facilitating Skills Quality Assurance, and Introduction to Security, Electrical/Mechanical Fundamentals and Logic With the last three being ranked are Introduction to Computer Aided Design, Foreign Language and Financial Skills.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to determine if a model Occupational Safety and Health (OSH) baccalaureate degree curriculum, in the USA could be developed. A secondary goal was to determine if Occupational Safety and Health practitioners and Occupational Safety and Health educators would agree on course offerings. In order to determine the curriculum and if educators and practitioners agreed investigation began with the following research questions.

1. Will a model safety and health curricula emerge?
2. Will safety educators and safety practitioners agree on courses?

Conclusions

The analysis tested indicated a significant difference among the practitioner on ranking of some of the courses. Data analysis using relative to an identified prior distribution (RIDIT) indicated that the z-value greatly surpassed the criteria for significant difference set at z $\pm$ 1.96 at the alpha < .05 level. Therefore it was determined a significant difference, non-congruency, in two core courses, five preparatory courses and eleven elective courses between the two groups. Practitioners tended to significantly rank less important than educators do the following courses.

Core Courses.

- Fundamentals of Industrial Hygiene and Toxicology (Z -2.467) ($p<.05$)
- Legal Aspects of Occupational Safety and Health (Z – 3.510) ($p<.05$)

Preparatory Courses.

The z-value showing a significant difference between the two groups, educators tended to rank the following courses more important.

- Computer Applications (Z –3.150) (p<.05)
- Chemistry with Laboratory and Including Organic (Z –4.550) (p<.05)
- Principles of Statistics (Z –4.090) (p<.05)
- Human Anatomy and Physiology (Z –2.500) (p<.05)
- Principles of Physics with Laboratory (Z –2.360) (p<.05)

Elective Courses.

Elective courses with the z-value showing a significant difference between the two groups, educators tended to rank the following elective courses more important.

- Technical Writing (Z -4.800) (p<.05)
- Research Methods (Z -4.320) (p<.05)
- Elements of Environmental Safety And Health (Z -3.090) (p<.05)
- Epidemiology (Z -3.660) (p<.05)

Elective courses with the z-value showing a significant difference between the two groups, practitioners tended to rank the following elective courses more important.

- Techniques of Business Management & Business Economics (Z 5.860) (p<.05)
- Logic (Z 3.900) (p<.05)
- Facilitating Skills (Z 6.410) (p<.05)
- Time Management (Z 5.510) (p<.05)

- Operating or Manufacturing Processes and Materials (Z 3.440) ($p < .05$)
- Financial Skills (Z -2.360) ($p < .05$)

Electrical/Mechanical Fundamentals, has a marginal significance at a z-value of 1.98, practitioners tended to rank the course higher.

A weighting scheme was conducted to consider overall ranking and congruency that weights the position of the ranked position with the level of congruency. This not only provides information indicating the overall ranked position of the course, but also high congruency amongst educators and practitioners. Based on the analysis this researcher decided it was not only, simply, the overall ranking that was important, but also essential to consider how the responding educators and practitioners thought the courses should be ranked. Factoring for congruency, based on ranked means and distributions and also for inclusion in curriculum, the courses ranked as follows:

Core.

1) Principles of Occupational Safety & Health
2) System Safety Analysis
3) Safety and Health Program Management
4) Analysis and Design for Safety
5) Fire Prevention/Protection and Control
6) Fundamentals of Industrial Hygiene and Toxicology
7) Experiential Occupational Safety and Health Learning
8) Ergonomics/Human Factors Engineering
9) Legal Aspects of Occupational Safety and Health

10) Safe Handling of Materials

11) Psychological Aspects of Safety and Health

12) Methodology for Safety Training

13) Product Safety

Preparatory courses overall ranking.

1) Computer Applications
2) Principles of Statistics
3) Chemistry with Laboratory and Including Organic
4) Human Anatomy and Physiology
5) Principles of Physics with Laboratory

Elective courses overall ranking.

1) Measurement of Safety Program Performance
2) Risk Management Loss Prevention/Control
3) Technical Writing
4) Epidemiology
5) Ethics of Safety
6) Chemical Safety
7) Fundamentals of Public Speaking
8) Motor Fleet and Transportation Safety
9) Labor Relations
10) Business Mathematics

11.5) Techniques of Business Management & Business Economics tied eleventh.

11.5) Elements of Environmental Safety and Health tied eleventh.

13.5) Writing Skills Including Rhetoric & Composition tied thirteenth.

13.5) Operating or Manufacturing Processes and Materials tied thirteenth

15) Research Methods

16) Construction Safety

17) Time Management

18) Facilitating Skills

19) Quality Assurance

20) Introduction to Security

21) Electrical/Mechanical Fundamentals

22) Logic

23) Introduction to Computer Aided Design

24) Foreign Language

25) Financial Skills

Graduates with degrees in occupational safety and health may find challenging positions in industrial facilities, federal, state and local government. The safety profession is diverse and interdisciplinary. The safety and health students need knowledge of many subjects inasmuch as safety and health is an eminent part of everything around us. To be able to communicate effectively they are required to have enough knowledge to work with people in many disciplines.

Universities and educators are strapped with the limited amount of credit hours for the length of program. Educators should provide advice based on the student's desired field or background. It is essential for the practicing safety professional to acquire a unique and diversified type of education and training in order to meet the challenges of the future.

The occupational safety and health students continually need to educate themselves. Some of the ranked suggested courses could be combined. Others could possibly be covered as a topic within a course. Suggestions from practitioners that more workers' compensation should be taught. This may be a problem for a university to cover workers' compensation for all regions of the USA. "There are 50 state and three federal workers' compensation jurisdictions each with its own statue and regulations." (Ashford, Caldart 1991,p.455) A student studying a course in workers' compensation in region 3 may very well find himself or herself employed in region 9 where the laws may not apply.

The technically trained compared to non-technically trained responders maintained similar median ranks of the courses. The only differences may be noticed in the ranking of courses Legal Aspects of Occupational Safety and Health, Ergonomics/Human Factors Engineering and Product Safety. These courses were ranked more important for the technical group than the non-technical group.

Respondents believed when a new occupational safety and health ruling comes out educators should prepare a course to meet the new laws. Educators must evaluate their curriculum in order to determine whether it meets the needs of the safety student, but not necessarily a full course in the new law. Responding practitioners believed record keeping should be a course offering. Educators responded these could be brought up as topics in one of the courses already in the process. Some of the courses could be included, by faculty advice, in the general studies part of degree prerequisites. Combining several topics into one, students can continue their professional development after graduation in there area. Responders suggested two separate courses for Fundamentals of Industrial Hygiene and Toxicology. The course of Hygiene and Toxicology combined would give the student an overall understanding for the importance of both. Perhaps a graduate course would be appropriate in Hygiene and one in Toxicology, depending on the students' interests. A baccalaureate curriculum does not appear to have room to add additional credit hours; there is only so much time.

Responding practitioners suggested a course be added to a safety curriculum in training techniques and speaking skills. In the course Chemistry with Laboratory including organic responding educators suggested not to include organic. Unless students want to spend additional years in a program, some of these topics can be learned by students going to seminars. Once the student has graduated is not the time to stop learning. The laws are constantly changing, technology is continually changing and the safety student, once graduated, has to continually monitor the new processes and keep learning. What was expected from a safety practitioner 30 years ago will still be expected today, in addition to numerous other duties. Being a safety practitioner is a continuous learning process, acquiring knowledge and skills to keep up with the changing times. Educators, as well, need to continuously monitor what is expected of the safety graduate. Visit locale business, listen to needs, network with other safety educators, and assess the safety program adjusting when appropriate or deemed necessary.

Educators and practitioners appear to have the least amount of variability for the following courses.

Core course. Principles of Occupational Safety and Health

Safety and Health Program Management

Preparatory course. Computer Applications

Elective course. Measurement of Safety Program Performance.

These are all managerial type courses that would serve all students well, no matter what area of emphasis they may choose.

The research concluded here can not insure the requirements needed in the future. This is a dynamic area of knowledge and in constant change. Laws will change; interests will change as well as budgets for educators and businesses. This research was to suggest to a student a well-rounded occupational health and safety education at the baccalaureate level. The student then may take their education to another level. Areas of interest to advance their studies may include hygiene, environmental or managerial. This research was meant to give a sense of direction on what the practitioners and educators were indicating was needed for a baccalaureate in occupational safety and health. Educators are working with credit hour limits, time limits, and budgets to prepare students to enter the ever-changing work force.

The exactness of the SAS system frequency analysis, whisker plot, also substantiated the concept of the construct validity of the instrument.

Reliability of the survey instrument to determine if the resulting information collected from the survey could be used with confidence, is a clear matter. All subjects were presented with a standardized survey, by one researcher using the same pilot members. A measure of significance of how poorly the relationship was to one another was given by the Z-value.

<u>Limitations of Study</u>

- Interdisciplinary nature of safety & health, therefore, difficult for participants to zero in on a curriculum.
- Organization of material received from participants; such as, same items different titles, word can mean many different things depending on how the person interprets it. Short course descriptions may have helped.
- The disagreement in ranking scales may be due to differences in relative importance and not more absolute importance.
- Influence of accrediting agencies and established curricula.
- Confusion of job titles for safety and health practitioners, which could influence perception of job function.
- Resistance to change with time and changing technology.

Recommendations

In view of the findings the following recommendations are offered:

1. It is suggested that core courses receiving the higher weighted rank be utilized as a model for occupational safety and health curriculum.

   Core:

   1) Principles of Occupational Safety & Health

   2) System Safety Analysis

   3.5) Safety and Health Program Management tied for third

   3.5) Analysis and Design for Safety tied for third

   5) Fire Prevention/Protection and Control

   6) Fundamentals of Industrial Hygiene and Toxicology

   7) Experiential Occupational Safety and Health Learning

   8) Ergonomics/Human Factors Engineering

   9) Legal Aspects of Occupational Safety and Health

2. It is suggested that core courses identified as being of least value by weighted rank have less emphasis placed on them as core requirements, however to be included in overall curriculum.

   Core:

   10) Safe Handling of Materials

   11) Psychological Aspects of Safety and Health

   12) Methodology for Safety Training

   13) Product Safety

3. It is suggested that the preparatory courses with the highest weighted rank be included in an occupational safety and health curriculum.

   Preparatory Course:

   1) Computer Applications
   2) Principles of Statistics

4. It is suggested that the preparatory courses with the lower weighted rank have less emphasis placed on them, however to be included in preparatory curriculum of area of emphasis. Area of emphasis would be of the students interested occupational direction.

   3) Chemistry with Laboratory and Including Organic
   4) Human Anatomy and Physiology
   5) Principles of Physics with Laboratory

5) It is suggested the elective courses with the higher weighted rank be included in an occupational safety and health curriculum relating to the area of emphasis the individual student chooses. The weighted rank order is as follows:

   Elective Courses:

   1) Measurement of Safety Program Performance
   2) Risk Management Loss Prevention/Control
   3) Technical Writing
   4) Epidemiology
   5) Ethics of Safety
   6) Chemical Safety
   7) Fundamentals of Public Speaking
   8) Motor Fleet and Transportation Safety
   9) Labor Relations
   10) Business Mathematics

11.5) Techniques of Business Management & Business Economics tied eleventh.

11.5) Elements of Environmental Safety and Health tied eleventh.

13.5) Writing Skills Including Rhetoric & Composition tied thirteenth.

13.5) Operating or Manufacturing Processes and Materials tied thirteenth.

15) Research Methods

16) Construction Safety

17) Time Management

18) Facilitating Skills

19) Quality Assurance

20) Introduction to Security

21) Electrical/Mechanical Fundamentals

22) Logic

23) Introduction to Computer Aided Design

24) Foreign Language

25) Financial Skills

6) It is suggested that educational institutions, with occupational safety and health programs use the weighted rankings, in program evaluation, to determine if their program meets the curriculum suggested by the respondents survey questionnaire.

7) It is suggested that individuals interested in investigating an occupational safety and health baccalaureate degree use the model suggested by this study. This study may be used to determine the occupational safety and health students course needs including their area of interest.

8) It is suggested that this study be replicated with a control group, over a longer period of time, including more demographic information, for example, the respondents exact years of safety experiences, type of

educational degree, type of real-world experience of educators, and so forth.

9) Combine much of the knowledge to successfully function in the safety and health arena into existing courses, for example, ethics, workers' compensation emphasizing that only theory is being offered and there is a continuing need for training in the area.
10) Safety and health curriculum should emphasize, at least, two tracks; that is technical and managerial.
11) Safety practitioners need to continue to attend seminars by universities and other organizations to keep up-to-date on safety and health issues.
12) Use of safety practitioners as an advisory group to safety and health educators, especially when developing or revising curriculum.
13) Developers of curricula and educators advising safety students should recognize the individuals who have interests in technical or managerial positions, thus directing them to take courses in the area of their interests.

APPENDIX A

Verbal Survey and Telephone Interview

Pilot Group Educators and Practitioners

Practitioner:

VERBAL SURVEY/ TELEPHONE -INTERVIEW

Respondent : ______________________ Practitioner ____________

Topic:______________________ Date: __________Time_______

Interviewer:________________E-mail____________________

Outline:	**Think About the College courses you took**:
1. Why:	did you take the courses you did?
2. What:	Courses would you change?
3.What:	Courses assist most in your safety function? Why?
4. What:	Courses are least important to your safety function? Why?
5. How:	Would you change the curriculum requirements? Why?
6. How:	Do you feel about your company training you as a safety professional?

Would you be interested in being on my pilot survey panel? You will fill out and return various surveys in a timely fashion? They will be surveys I send and kept in strict confidence.

Educator:

VERBAL SURVEY/ TELEPHONE -INTERVIEW

Respondent :______________________________Educator __________________.

Topic:______________________________ Date: ___________Time___________

Interviewer:__________________E-mail___________________________________

Outline:

1. What degree do you have?

2. In what discipline is your degree?

Think About the College courses you teach:

3. What courses do you teach most?

4. In your opinion what would you **add**, **change** or **delete** from the Occupational Safety & Health program?

Would you be interested in being on my pilot survey panel? You will fill out and return various surveys in a timely fashion? They will be surveys I send and kept in strict confidence.

APPENDIX B

Survey I

Pilot Group

Educators and Practitioners

SURVEY I PRACTITIONERS

Survey I *M.L. Kolbe-Mims* «PR» «ID»
31 Apache Court
Appleton, WI 54911-1012
Email: mimsm@juno.com Phone/Fax (920)731-7548

September 8, 1998

Dear: «Greetings»

Thank you, for agreeing to participate in the **pilot group** to help me gather information with what could be a USA Model Safety and Health Bachelors Curriculum.

This is the first of a series of surveys you will receive. Please return the survey in the self addressed stamped envelope on or before **October 13**, 1998.

If necessary write on the back or attach additional sheets, using corresponding numbers to the question.

1. What is the primary objective(s) of your position? (e.g. **list functions**)
2. **List** the major areas of accountability in your position.(e.g. safety inspections, etc.)
3. **List what skill(s)** you need to do your job. (e.g. hazard awareness, etc.)
4. **List** how you acquire the **knowledge** to perform in your job. (e.g. coursework, etc.)

Thank You *Please return on or* **before Oct.13, 1998**

Margie

SURVEY I EDUCATORS

Survey I *M.L. Kolbe-Mims* «ED» «ID»
31 Apache Court
Appleton, WI 54911-1012
Email: mimsm@juno.com Phone/Fax (920) 731-7548

September 08, 1998

Dear: «Greetings»

Thank you, for agreeing to participate in the **pilot group** to help me gather information with what could be a USA Model Safety and Health Bachelors Curriculum.

This is the first of a series of surveys you will receive. Please return the survey in the self addressed stamped envelope on or before **October 13,** 1998.

If necessary write on the back or attach additional sheets, using corresponding numbers to the question.

1. What is the primary objective(s) of a safety practitioner? (e.g. **list functions**)
2. **List** the major areas of accountability of a safety practitioner. (e.g. safety inspections, etc.)
3. **List what skill(s)** practitioners need to do their job. (e.g. hazard awareness, etc.)
4. **List** how practitioners acquire the knowledge to perform in their job. (e.g. coursework, etc.)

Thank You *Please return on or* **before Oct.13, 1998**

Margie

APPENDIX C

Survey II

Pilot Group

Educators and Practitioners

Survey II

M.L.Kolbe-Mims
401 Charlemagne Blvd. Unit 203 B
Naples, FL. 34112-7092

Email: mimsm@juno.com Phone/Fax (941)732-0263

<PR> «ED» «ID»

January 05,1999

Dear: «Greetings»

Once again Thank you, for agreeing to participate in the **pilot group** to help me gather information with what **could** be a USA Model Safety and Health **Bachelors** Curriculum.

The overall response to the survey was that the safety practitioner's primary objective is to:

- Reduce work-related injury and illness.
- Reduce operating cost through safety.
- Increase safety awareness at all levels of the organization.
- Implement and oversee health and safety policy.
- Comply with legislative standards for the industry.
- Fit with organizational culture of the enterprise.
- Encourage and support employee involvement.
- Have common sense, and dedication to the job.

Within the scope of the objective would include other function's; i.e.,

- Recognize
- Evaluate
- Monitor and
- Control Hazards etc.,

Each survey was reviewed with a list of all topics created. The information from suggested course names are included in the list. However, course titles are reserved for the final survey.

Attached you will find the list mark **Each ONE** as to how you feel it is important to a Safety and Health curriculum. If you have others add them to the bottom of the list or on the back of the paper.

Once again, this will be used to build the next survey.

Kindly return on or before **February 1, 1999**.

Note the change of address and different Phone/Fax numbers

Thank You

Margie

Please return on or before Feb. 1, 1999

M.L.Kolbe-Mims
401 Charlemagne Blvd. Unit 203 B
Naples, FL. 34112-7092

Email: mimsm@juno.com
Phone/Fax (941)732-0263

Place an { x } in the box that best reflects the importance to a Safety and Health Practitioner.

Headings	Extremely Important	Important	Moderately Important	Not at all Important
Accident / Incident Investigation				
Adaptability/ Altruism/ Positive Attitude				
Air Sampling				
Anatomy/ Body Structures & Functions				
Audits				
Behavior Skills/ Interpersonal Skills				
Budgeting				
Chemical Knowledge & Information				
Coaching/ Orientation				
Common Sense				
Communication/ Oral & Written				
Compliance Audits				
Computer Literacy / Skills				
Conducting Meeting Skills				
Conflict Resolution				
Critical Thinking/ Analytical Skills				
Customer Service				
Data Collection/ Processing				
Decision Making				
Deductive Reasoning				
Delegation				
Design of Engineering Hazards				
Design Review/ Building & Fire Codes				
Design/ Development of Safety Program				
Determine Regulatory Compliance				
Develop Emergency & Disaster Control				
Development Strategies				
Drafting				
Electrical & Mechanical Basics				
Electronic Equipment Skills				
Employee Safety Training & Development				
Environmental Protection				
Equipment Maintenance/ Inspection Records				
Facilitating Skills				
Financial Management/ Cost Skills				
Fire Clothing Assessment				
Flexibility				

M.L.Kolbe-Mims
401 Charlemagne Blvd. Unit 203 B
Naples, FL. 34112-7092

Email: mimsm@juno.com

Phone/Fax (941)732-0263

Place an [x] in the box that best reflects the importance to a Safety and Health Practitioner

	Headings	Extremely Important	Important	Moderately Important	Not at all Important
	Foreign Language				
	General Labor Laws				
	Guarding				
	Handling Multiple Priorities				
	Hazard Recognition, Evaluation, & Control				
	Hearing Conservation				
	Honesty				
	Human Resources				
	Indoor Air Quality				
	Inspections				
	Instrumentation				
	International Safety				
	Internet Skills				
	Internship				
	Interpreting Reports				
	Interviewing				
	Investigating				
	Labor Relations				
	Leadership Skills				
	Liability				
	Listening				
	Lockout/ Tagout				
	Long Range Planning				
	Loss Control				
	Loss Prevention				
	Management by Objectives				
	Marketing/ Selling				
	Maximize Productivity (bottom line)				
	Measurement/ Evaluation				
	Monitoring				
	Motivation				
	Multiculturalism				
	Negotiation				
	Noise				
	Operational Processes				
	Organizational Skills (Culture)				
	Personal Protective Equipment Knowledge				
	Planning				
	Policy				

M.L.Kolbe-Mims
401 Charlemagne Blvd. Unit 203 B
Naples, FL. 34112-7092

Email: mimsm@juno.com
Phone/Fax (941)732-0263

Place an [x] in the box that best reflects the importance to a Safety and Health Practitioner

	Headings	Extremely Important	Important	Moderately Important	Not at all Important
	Positive Attitude				
	Presentation Skills				
	Problem Solving				
	Process Safety				
	Product Liability Reduction				
	Program Development/ Implementation				
	Program/ Evaluation/ Management				
	Project Assignment				
	Project Management				
	Promotion of Safety Program				
	Psychological Skills				
	Purchasing Approvals				
	Quality Assurance				
	Radiation				
	Record Keeping				
	Regulatory Understanding & Compliance				
	Report Writing				
	Research Methods				
	Resource Safety				
	Respiratory				
	Review Construction Plans				
	Risk Assessment & Management				
	Safety Theory				
	Safety Through Design				
	Severity Reduction				
	Speaking Skills				
	Staff Advising				
	Standards (NFPA/ Ansi etc.)				
	Supervision				
	Team Building				
	Tenacity				
	Time Management Skills				
	Toxicology				
	Ventilation				
	Waste Disposal				
	Wellness & Return To Work Programs				
	Workers' Compensation				
	Writing Skills				

APPENDIX D

Survey I I I

Pilot Group

Educators and Practitioners

Survey III

M.L.Kolbe-Mims
401 Charlemagne Blvd. Unit 203 B
Naples, FL. 34112-7092

Email: mimsm@juno.com

Phone/Fax (941)732-0263

March 06,1999

Dear «Greetings»:

Once again Thank you, for participating in the **pilot** group to help me gather information with what **could** be a USA Model Safety and Health **Baccalaureate** Curriculum.

The results of each Survey 2 were perused and documented. The information from suggested duplicates were combined; e.g., computer literacy skills and internet skills and the results were then scored and ranked using Spearman rank order.

On **page 2** is a list of items (skill, topic or knowledge) which, according to pilot group responses, are ranked in order of importance. In an effort to further condense these items, mark **Each ONE with an (X)** as to how you feel it is important to a baccalaureate safety and health curriculum. This will serve as the concluding register to finalize a catalogue of course titles to be rated on the last survey.

On **page 3** is a sampling of course titles that came from current college & university offerings. Mark **Each ONE with an (X)** as to how you rate its importance to a baccalaureate safety and health curriculum. Also, list and rank any additional such course titles on the bottom or reverse side of the paper. These course titles will be used as a seed or starter group to be used for the final survey.

The final survey will be sent to the pilot group, as well as a much larger number, of safety practitioners and Educators for the closing statistical analysis.

Kindly return the survey on or before **April 1, 1999**.

Thank You

Margie

Return on or before April 1,1999

M.L.Kolbe-Mims
401 Charlemagne Blvd. Unit 203 B
Naples, FL. 34112-7092
Email: mimsm@juno.com

Phone/Fax (941)732-0263

Place an { x } in the box that best reflects the importance to a Safety and Health Practitioner.

Headings Listed by rank order.		Extremely Important	Important	Somewhat Important	Not at all Important
1	Behavior Skills/ Interpersonal Skills				
2	Communication/ Oral & Written				
3	Common Sense/ Problem Solving				
4	Design /Develop /Implement /Promote Safety Program				
5	Leadership Skills				
6	Safety through Design (Guarding etc.)				
7	Regulatory Compliance (Standards NFPA/ANSI etc.)				
8	Audits/ Compliance Audits (Monitoring / Inspections etc.)				
9	Labor Relations				
10	Computer Literacy				
11	Time Management Skills / Planning				
12	Hazard Recognition Evaluation & Control				
13	Record keeping (e.g. Gov. Regs., Workers' Comp.)				
14	Employee Safety Training & Development				
15	Operational Processes/ Elect. Mech. Basics /Process Safety				
16	Accident / Incident Investigation				
17	Report Writing/ Interpreting Reports				
18	Loss Prevention / Control				
19	Measurement / Evaluation of Program				
20	Noise & Hearing Conservation				
21	Project Management				
22	Chemical Knowledge				
23	Financial Skills				
24	Policy (e.g. Purchasing approvals)				
25	Safety Theory (Resources, etc.)				
26	Liability				
27	Anatomy/ Body Structures & Functions (e.g. Respiratory)				
28	Ventilation				
29	Risk Assessment & Management				
30	Handling Multiple Priorities				
31	Management by Objectives				
32	Personal Protective Equipment Knowledge				
33	Develop Emergency & Disaster Control				
34	Marketing / Selling (e.g., of Safety)				
35	Facilitating Skills				
36	Customer Service (Knowing your customers e.g., employees)				
37	Environmental Protection				
38	Research Methods (Review Literature e.g. study to discover safe practices)				
39	Maximize Productivity (How safety affects the bottom line)				
40	Air Sampling				
41	Toxicology				
42	Experiential Learning (Internship /Coop Program)				
43	Multiculturalism				
44	Equipment Maintenance/ Inspection Records				
45	Radiation				
46	Quality Assurance				
47	International Safety				
48	Fire Clothing Assessment				
49	Foreign Language				
50	Drafting				

M.L.Kolbe-Mims
401 Charlemagne Blvd. Unit 203 B
Naples, FL. 34112-7092
Email: mimsm@juno.com

Phone/Fax (941)732-0263

Place an { x } in the box that best reflects the importance to a Safety and Health Practitioner.

Professional Core	Extremely Important	Important	Somewhat Important	Not at All Important
Analysis and Design For Safety				
Construction Safety				
Elements of Environmental Safety				
Ergonomics / Human Factors Engineering				
Experiential Occupational Safety and Health Learning: e.g., Internship, Coop, Practicum				
Fire Protection / Prevention and Control				
Fundamentals of Industrial Hygiene and Toxicology				
Introduction to Security				
Legal Aspects of Occupational Safety and Health				
Methodology For Safety Training				
Motor Fleet and Transportation Safety				
Principles of Occupational Safety				
Psychological Aspects of Safety and Health				
Safety and Health Management				
System Safety Analysis				

Preparation Courses	Extremely Important	Important	Somewhat Important	Not at All Important
Chemistry with Laboratory and Including Organic				
General Statistics				
Human Anatomy and Physiology				
Physics with Laboratory				

Other Requirements	Extremely Important	Important	Somewhat Important	Not at All Important
Communications				
Production Concepts				
Fundamentals of Computer Science				
Elementary Business Administration (Include budgeting)				

Please return on or **before April 1, 1999**

APPENDIX E

Survey IV

Total Sample

M.L.Kolbe-Mims
31 Apache Court
Appleton, WI 54911-1012

Email: mimsm@juno.com
Phone/Fax (920) 731-7548

August, 9, 1999

Dear: (first name of respondent)

I am working on research to complete my doctoral degree in Occupational Health and Safety, and I need your help.

My study is entitled **University Curricula Analysis for Occupational Health and Safety In the United States**. I have assembled the enclosed questionnaire in order to survey university health and safety faculties and safety practitioners to determine which courses in the safety curriculum are most important to provide students with the proper balance of safety management and scientific training required in the occupational health and safety field.

The suggested Core Curriculum for Occupational Health and Safety was determined by a pilot group of Occupational Health and Safety Educators and Practitioners. The courses on the following pages are for your evaluation.

You have been selected to participate in this survey because of your expertise in the safety field.

It is my pleasure to personally invite you to participate in this study. Please return on or before September 10, 1999 in the self addressed stamped envelope. I thank you for taking the time to complete this survey.

Sincerely,

Margie

Margie L. Kolbe-Mims

Please return by September 10, 1999

M.L.Kolbe-Mims
31 Apache Court
Appleton, WI 54911-1012

Email: mimsm@juno.com

Phone/Fax (920) 731-7548

Core Courses For Occupational Safety & Health

Pages 2 and 3 include course titles that are a result of information drawn from a pilot group of Safety Educators and Practitioners.

Place an (x) in the box

That best reflects the importance to an Occupational Safety & Health Curriculum

	Core Courses	Extremely Important	Important	Somewhat Important	Not at All Important
1	Principles of Occupational Safety & Health				
2	Fundamentals of Industrial Hygiene and Toxicology				
3	Safety and Health Program Management				
4	Psychological Aspects of Safety and Health				
5	Analysis and Design For Safety				
6	Methodology for Safety Training				
7	Experiential Occupational Safety & Health Learning				
8	Legal Aspects of Occupational Safety and Health				
9	Fire Prevention/ Protection and Control				
10	Ergonomics/ Human Factors Engineering				
11	System Safety Analysis				
12	Product Safety				
13	Safe Handling of Materials				
	Preparatory Courses For Occupational Safety & Health				
1	Computer Applications				
2	Chemistry with Laboratory and Including Organic				
3	Principles of Statistics				
4	Human Anatomy and Physiology				
5	Principles of Physics with Laboratory				

M.L. Koble-Mims
31 Apache Court
Appleton, WI 54911-1012

Email: mimsm@juno.com

Phone/Fax (920) 731-7548

Electives For Occupational Safety & Health

Place an {x} in the box
That best reflects the importance to an Occupational Safety & Health Curriculum

	Electives	Extremely Important	Important	Somewhat Important	Not at All Important
1	Techniques of Business Management & Business Economics				
2	Logic				
3	Technical Writing				
4	Measurement of Safety Program Performance				
5	Facilitating Skills				
6	Risk Management; Loss Prevention/ Control				
7	Research Methods				
8	Time Management				
9	Operating or Manufacturing Processes and Materials				
10	Financial Skills				
11	Chemical Safety				
12	Elements of Environmental Safety And Health				
13	Labor Relations				
14	Quality Assurance				
15	Foreign Language				
16	Intro to Computer Aided Design				
17	Ethics of Safety				
18	Fundamentals of Public Speaking				
19	Business Mathematics				
20	Writing Skills Including Rhetoric & Composition				
21	Construction Safety				
22	Motor Fleet and Transportation Safety				
23	Introduction to Security				
24	Epidemiology				
25	Electrical/ Mechanical Fundamentals				

APPENDIX F

RIDIT Analysis

RIDIT Analysis

When two samples are being compared, the data may be arrayed as shown in Table X. The proportions (p_{11},.... P_{k1}) represent the frequency distribution in sample 1,

Table X

Relative frequency distributions from two samples

Ordered Outcome Categories	Sample 1 n_1	Sample 2 n_2	Total
1	p_{11}	P_{12}	$\mathbf{P_1}$
2	P_{21}	P_{22}	$\mathbf{P_2}$
. . .			
.	p_{k1}	p_{k2}	$\mathbf{P_k}$
K	1.00	1.00	1.00

and the proportions (p_{12},..., p_{k2}) represent the frequency distribution in sample 2. The frequency distribution in the combined sample is ($\mathbf{P_1}$, ... $\mathbf{P_k}$), where

$$P_i = \frac{n_1 p_{i1} + n_2 p_{i2}}{N}$$

(i = 1, . . . , k) with N = n_1+ n_2 the total sample size. The value of chi-square with k - 1 degrees of freedom may be found using the following formula,

$$\chi^2 = \frac{n_1 n_2}{N} \sum_{i=1}^{k} \frac{(p_{i1} - p_{i2})^2}{P_i}$$

although an appropriate test, crucial information on the natural ordering of the k categories is lost.

In this research Educators have been selected as the reference group. To do a RIDIT analysis, as pointed out by Selvin (1977), may be more sensitive to the chi-square statistic for comparing two independent samples when the variable under study can be classified into an ordered category. Consider a series of observations classified into 4-ordered (ranked) categories:

	1	2	3	4	Total
Reference Group	Y1	Y2	Y3	Y4	n_1
Comparison Group	X1	X2	X3	X4	n_2

Ordered Categories	(1)	(2)	(3)	RIDIT Weights $(r_i)=[(2)+(3)]/n_1$
1	Y1	Y1/2	0	$(y1/2)/n_1$
2	Y2	Y2/2	Y1	$(y1+y2/2)/n_1$
3	Y3	Y3/2	Y1+y2	$(y1+y2+y3/2)/n_1$
4	Y4	Y4/2	Y1+y2+y3	$(y1+y2+y3+y4/2)/n_1$

The mean RIDIT for the comparison group is simply the sum of the products of the observed frequencies times the corresponding RIDIT weights, divided by the total

$$\bar{r}=\sum_{i=1}^{k} r_i Y_i$$

frequency (n_1).

The standard error of the mean for the comparison group is given by:

$$s.e.(\bar{r})=\frac{1}{2\sqrt{3n_2}}\sqrt{1+\frac{n_2+1}{n_1}+\frac{1}{n_1(n_1+n_2-1)}-\frac{\sum(n_{1j}+n_{2j})^3}{n_1(n_1+n_2)(n_1+n_2-1)}}$$

A test of significance of the difference between the obtained mean RIDIT and the standard value of .50 may be given as:

$$Z=\frac{\bar{r}-.5}{s.e.(\bar{r})}$$

APPENDIX G

SAS System

Distribution of Ranks Total Sample

Distributions of ranks for the total population core courses

The FREQ Procedure

c1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
2	1	0.30	2	0.59
3	53	15.73	55	16.32
4	282	83.68	337	100.00

c2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	3	0.89	3	0.89
2	17	5.04	20	5.93
3	105	31.16	125	37.09
4	212	62.91	337	100.00

c3	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	14	4.15	14	4.15
3	100	29.67	114	33.83
4	223	66.17	337	100.00

c4	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	2	0.59	2	0.59
2	86	25.52	88	26.11
3	167	49.55	255	75.67
4	82	24.33	337	100.00

c5	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	4	1.19	5	1.48
2	58	17.21	63	18.69
3	146	43.32	209	62.02
4	128	37.98	337	100.00

c6	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	4	1.19	5	1.48
2	80	23.74	85	25.22
3	166	49.26	251	74.48
4	86	25.52	337	100.00

c7	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	26	7.74	27	8.04
2	126	37.50	153	45.54
3	106	31.55	259	77.08
4	77	22.92	336	100.00

Frequency Missing = 1

c8	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	0.30	1	0.30
2	45	13.35	46	13.65
3	137	40.65	183	54.30
4	154	45.70	337	100.00

c9	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	2	0.59	2	0.59
2	47	13.95	49	14.54
3	157	46.59	206	61.13
4	131	38.87	337	100.00

c10	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	0.30	1	0.30
2	31	9.20	32	9.50
3	135	40.06	167	49.55
4	170	50.45	337	100.00

c11	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	5	1.48	5	1.48
2	78	23.15	83	24.63
3	153	45.40	236	70.03
4	101	29.97	337	100.00

c12	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	11	3.26	12	3.56
2	159	47.18	171	50.74
3	129	38.28	300	89.02
4	37	10.98	337	100.00

c13	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	8	2.38	8	2.38
2	53	15.77	61	18.15
3	170	50.60	231	68.75
4	105	31.25	336	100.00

Frequency Missing = 1

Distributions of ranks for the total population --

Preparatory courses

The FREQ Procedure

p1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	3	0.89	3	0.89
2	30	8.93	33	9.82
3	127	37.80	160	47.62
4	176	52.38	336	100.00

Frequency Missing = 1

p2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	14	4.15	14	4.15
2	66	19.58	80	23.74
3	157	46.59	237	70.33
4	100	29.67	337	100.00

p3	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	3	0.89	3	0.89
2	98	29.08	101	29.97
3	166	49.26	267	79.23
4	70	20.77	337	100.00

p4	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	13	3.86	13	3.86
2	94	27.89	107	31.75
3	146	43.32	253	75.07
4	84	24.93	337	100.00

p5	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	19	5.64	19	5.64
2	118	35.01	137	40.65
3	134	39.76	271	80.42
4	66	19.58	337	100.00

Distributions of ranks for the total population - Elective courses

The FREQ Procedure

e1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	18	5.34	19	5.64
2	101	29.97	120	35.61
3	135	40.06	255	75.67
4	82	24.33	337	100.00

e2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	35	10.48	36	10.78
2	175	52.40	211	63.17
3	99	29.64	310	92.81
4	24	7.19	334	100.00

Frequency Missing = 3

e3	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	3	0.89	4	1.19
2	43	12.76	47	13.95
3	135	40.06	182	54.01
4	155	45.99	337	100.00

e4	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	2	0.59	3	0.89
2	45	13.35	48	14.24
3	157	46.59	205	60.83
4	132	39.17	337	100.00

e5	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	15	4.45	16	4.75
2	109	32.34	125	37.09
3	139	41.25	264	78.34
4	73	21.66	337	100.00

e6	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	1	0.30	2	0.59
2	34	10.09	36	10.68
3	170	50.45	206	61.13
4	131	38.87	337	100.00

e7	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	25	7.42	26	7.72
2	155	45.99	181	53.71
3	123	36.50	304	90.21
4	33	9.79	337	100.00

e8	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	29	8.61	30	8.90
2	122	36.20	152	45.10
3	137	40.65	289	85.76
4	48	14.24	337	100.00

e9	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	16	4.76	17	5.06
2	110	32.74	127	37.80
3	147	43.75	274	81.55
4	62	18.45	336	100.00

Frequency Missing = 1

e10	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2	0.60	2	0.60
1	26	7.74	28	8.33
2	163	48.51	191	56.85
3	111	33.04	302	89.88
4	34	10.12	336	100.00

Frequency Missing = 1

e11	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	4	1.19	5	1.49
2	61	18.15	66	19.64
3	184	54.76	250	74.40
4	86	25.60	336	100.00

Frequency Missing = 1

e12	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	4	1.19	5	1.48
2	38	11.28	43	12.76
3	175	51.93	218	64.69
4	119	35.31	337	100.00

e13	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	16	4.75	17	5.04
2	136	40.36	153	45.40
3	139	41.25	292	86.65
4	45	13.35	337	100.00

e14	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	31	9.20	32	9.50
2	166	49.26	198	58.75
3	112	33.23	310	91.99
4	27	8.01	337	100.00

e15	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	112	33.23	113	33.53
2	182	54.01	295	87.54
3	36	10.68	331	98.22
4	6	1.78	337	100.00

e16	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	79	23.44	80	23.74
2	177	52.52	257	76.26
3	67	19.88	324	96.14
4	13	3.86	337	100.00

e17	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	5	1.48	6	1.78
2	68	20.18	74	21.96
3	141	41.84	215	63.80
4	122	36.20	337	100.00

e18	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	5	1.48	6	1.78
2	56	16.62	62	18.40
3	148	43.92	210	62.31
4	127	37.69	337	100.00

e19	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	2	0.59	2	0.59
1	34	10.09	36	10.68
2	115	34.12	151	44.81
3	148	43.92	299	88.72
4	38	11.28	337	100.00

e20	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	14	4.17	15	4.46
2	56	16.67	71	21.13
3	138	41.07	209	62.20
4	127	37.80	336	100.00

Frequency Missing = 1

e21	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	5	1.48	6	1.78
2	76	22.55	82	24.33
3	184	54.60	266	78.93
4	71	21.07	337	100.00

e22	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	5	1.48	6	1.78
2	120	35.61	126	37.39
3	160	47.48	286	84.87
4	51	15.13	337	100.00

e23	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	58	17.21	59	17.51
2	185	54.90	244	72.40
3	76	22.55	320	94.96
4	17	5.04	337	100.00

e24	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	28	8.31	29	8.61
2	151	44.81	180	53.41
3	131	38.87	311	92.28
4	26	7.72	337	100.00

e25	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1	0.30	1	0.30
1	11	3.26	12	3.56
2	96	28.49	108	32.05
3	157	46.59	265	78.64
4	72	21.36	337	100.00

APPENDIX H

SAS System

Core Course Ranking by Educators and Practitioners

Core Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The SAS System
The FREQ Procedure
Table of c1 by group

course 1 / Frequency / Percent / Row Pct / Col Pct	group 0	group 1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
2	0 0.00 0.00 0.00	1 0.30 100.00 0.60	1 0.30
3	26 7.72 49.06 15.20	27 8.01 50.94 16.27	53 15.73
4	144 42.73 51.06 84.21	138 40.95 48.94 83.13	282 83.68
Total	171 50.74	166 49.26	337 100.00

Core Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of c2 by group

c2 Frequency Percent Row Pct Col Pct	group 0	1	Total
1	1 0.30 33.33 0.58	2 0.59 66.67 1.20	3 0.89
2	8 2.37 47.06 4.68	9 2.67 52.94 5.42	17 5.04
3	45 13.35 42.86 26.32	60 17.80 57.14 36.14	105 31.16
4	117 34.72 55.19 68.42	95 28.19 44.81 57.23	212 62.91
Total	171 50.74	166 49.26	337 100.00

Core Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of c3 by group

c3 / Frequency / Percent / Row Pct / Col Pct	group 0	1	Total
2	6 1.78 42.86 3.51	8 2.37 57.14 4.82	14 4.15
3	50 14.84 50.00 29.24	50 14.84 50.00 30.12	100 29.67
4	115 34.12 51.57 67.25	108 32.05 48.43 65.06	223 66.17
Total	171 50.74	166 49.26	337 100.00

Core Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of c4 by group

c4 / Frequency / Percent / Row Pct / Col Pct	group 0	group 1	Total
1	1 0.30 50.00 0.58	1 0.30 50.00 0.60	2 0.59
2	40 11.87 46.51 23.39	46 13.65 53.49 27.71	86 25.52
3	91 27.00 54.49 53.22	76 22.55 45.51 45.78	167 49.55
4	39 11.57 47.56 22.81	43 12.76 52.44 25.90	82 24.33
Total	171 50.74	166 49.26	337 100.00

Core Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of c5 by group

c5 Frequency Percent Row Pct Col Pct	group 0	1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	2 0.59 50.00 1.17	2 0.59 50.00 1.20	4 1.19
2	34 10.09 58.62 19.88	24 7.12 41.38 14.46	58 17.21
3	68 20.18 46.58 39.77	78 23.15 53.42 46.99	146 43.32
4	66 19.58 51.56 38.60	62 18.40 48.44 37.35	128 37.98
Total	171 50.74	166 49.26	337 100.00

Core Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of c6 by group

c6 (Frequency / Percent / Row Pct / Col Pct)	group 0	group 1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	2 0.59 50.00 1.17	2 0.59 50.00 1.20	4 1.19
2	43 12.76 53.75 25.15	37 10.98 46.25 22.29	80 23.74
3	82 24.33 49.40 47.95	84 24.93 50.60 50.60	166 49.26
4	43 12.76 50.00 25.15	43 12.76 50.00 25.90	86 25.52
Total	171 50.74	166 49.26	337 100.00

Core Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of c7 by group

c7 / Frequency / Percent / Row Pct / Col Pct	group 0	1	Total
0	1 0.30 100.00 0.59	0 0.00 0.00 0.00	1 0.30
1	11 3.27 42.31 6.47	15 4.46 57.69 9.04	26 7.74
2	62 18.45 49.21 36.47	64 19.05 50.79 38.55	126 37.50
3	53 15.77 50.00 31.18	53 15.77 50.00 31.93	106 31.55
4	43 12.80 55.84 25.29	34 10.12 44.16 20.48	77 22.92
Total	170 50.60	166 49.40	336 100.00

Frequency Missing = 1

Core Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of c8 by group

c8 / Frequency / Percent / Row Pct / Col Pct	group 0	1	Total
1	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
2	15 4.45 33.33 8.77	30 8.90 66.67 18.07	45 13.35
3	66 19.58 48.18 38.60	71 21.07 51.82 42.77	137 40.65
4	89 26.41 57.79 52.05	65 19.29 42.21 39.16	154 45.70
Total	171 50.74	166 49.26	337 100.00

Core Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of c9 by group

c9 Frequency Percent Row Pct Col Pct	group 0	1	Total
1	2 0.59 100.00 1.17	0 0.00 0.00 0.00	2 0.59
2	21 6.23 44.68 12.28	26 7.72 55.32 15.66	47 13.95
3	78 23.15 49.68 45.61	79 23.44 50.32 47.59	157 46.59
4	70 20.77 53.44 40.94	61 18.10 46.56 36.75	131 38.87
Total	171 50.74	166 49.26	337 100.00

Core Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of c10 by group

c10 Frequency Percent Row Pct Col Pct	group 0	1	Total
1	0 0.00 0.00 0.00	1 0.30 100.00 0.60	1 0.30
2	15 4.45 48.39 8.77	16 4.75 51.61 9.64	31 9.20
3	66 19.58 48.89 38.60	69 20.47 51.11 41.57	135 40.06
4	90 26.71 52.94 52.63	80 23.74 47.06 48.19	170 50.45
Total	171 50.74	166 49.26	337 100.00

Core Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of c11 by group

c11 Frequency Percent Row Pct Col Pct	group 0	1	Total
1	3 0.89 60.00 1.75	2 0.59 40.00 1.20	5 1.48
2	39 11.57 50.00 22.81	39 11.57 50.00 23.49	78 23.15
3	73 21.66 47.71 42.69	80 23.74 52.29 48.19	153 45.40
4	56 16.62 55.45 32.75	45 13.35 44.55 27.11	101 29.97
Total	171 50.74	166 49.26	337 100.00

Core Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of c12 by group

Course 12 Frequency Percent Row Pct Col Pct	group 0	1	Total
0	0 0.00 0.00 0.00	1 0.30 100.00 0.60	1 0.30
1	6 1.78 54.55 3.51	5 1.48 45.45 3.01	11 3.26
2	81 24.04 50.94 47.37	78 23.15 49.06 46.99	159 47.18
3	69 20.47 53.49 40.35	60 17.80 46.51 36.14	129 38.28
4	15 4.45 40.54 8.77	22 6.53 59.46 13.25	37 10.98
Total	171 50.74	166 49.26	337 100.00

Core Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of c13 by group

course 13 / Frequency / Percent / Row Pct / Col Pct	group 0	1	Total
1	7 2.08 87.50 4.09	1 0.30 12.50 0.61	8 2.38
2	30 8.93 56.60 17.54	23 6.85 43.40 13.94	53 15.77
3	77 22.92 45.29 45.03	93 27.68 54.71 56.36	170 50.60
4	57 16.96 54.29 33.33	48 14.29 45.71 29.09	105 31.25
Total	171 50.89	165 49.11	336 100.00

Frequency Missing = 1

APPENDIX I

SAS System

Preparatory Course Ranking by Educators and Practitioners

Preparatory Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of p1 by group

Preparatory course 1 group

Frequency Percent Row Pct Col Pct	0	1	Total
1	3 0.89 100.00 1.75	0 0.00 0.00 0.00	3 0.89
2	12 3.57 40.00 7.02	18 5.36 60.00 10.91	30 8.93
3	54 16.07 42.52 31.58	73 21.73 57.48 44.24	127 37.80
4	102 30.36 57.95 59.65	74 22.02 42.05 44.85	176 52.38
Total	171 50.89	165 49.11	336 100.00

Frequency Missing = 1

Preparatory Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of p2 by group

p2 Frequency Percent Row Pct Col Pct	group 0	1	Total
1	4 1.19 28.57 2.34	10 2.97 71.43 6.02	14 4.15
2	27 8.01 40.91 15.79	39 11.57 59.09 23.49	66 19.58
3	76 22.55 48.41 44.44	81 24.04 51.59 48.80	157 46.59
4	64 18.99 64.00 37.43	36 10.68 36.00 21.69	100 29.67
Total	171 50.74	166 49.26	337 100.00

Preparatory Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of p3 by group

p3 / group Frequency Percent Row Pct Col Pct	0	1	Total
1	1 0.30 33.33 0.58	2 0.59 66.67 1.20	3 0.89
2	41 12.17 41.84 23.98	57 16.91 58.16 34.34	98 29.08
3	82 24.33 49.40 47.95	84 24.93 50.60 50.60	166 49.26
4	47 13.95 67.14 27.49	23 6.82 32.86 13.86	70 20.77
Total	171 50.74	166 49.26	337 100.00

Preparatory Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of p4 by group

p4 / Frequency / Percent / Row Pct / Col Pct	group 0	1	Total
1	7 2.08 53.85 4.09	6 1.78 46.15 3.61	13 3.86
2	39 11.57 41.49 22.81	55 16.32 58.51 33.13	94 27.89
3	77 22.85 52.74 45.03	69 20.47 47.26 41.57	146 43.32
4	48 14.24 57.14 28.07	36 10.68 42.86 21.69	84 24.93
Total	171 50.74	166 49.26	337 100.00

Preparatory Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of p5 by group

p5 / Frequency, Percent, Row Pct, Col Pct	group 0	group 1	Total
1	8 2.37 42.11 4.68	11 3.26 57.89 6.63	19 5.64
2	58 17.21 49.15 33.92	60 17.80 50.85 36.14	118 35.01
3	62 18.40 46.27 36.26	72 21.36 53.73 43.37	134 39.76
4	43 12.76 65.15 25.15	23 6.82 34.85 13.86	66 19.58
Total	171 50.74	166 49.26	337 100.00

APPENDIX J

SAS System

Elective Course Ranking by Educators and Practitioners

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e1 by group

e1 / group (Frequency, Percent, Row Pct, Col Pct)	0	1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	14 4.15 77.78 8.19	4 1.19 22.22 2.41	18 5.34
2	60 17.80 59.41 35.09	41 12.17 40.59 24.70	101 29.97
3	71 21.07 52.59 41.52	64 18.99 47.41 38.55	135 40.06
4	25 7.42 30.49 14.62	57 16.91 69.51 34.34	82 24.33
Total	171 50.74	166 49.26	337 100.00

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e2 by group

e2 / group Frequency Percent Row Pct Col Pct	0	1	Total
0	1 0.30 100.00 0.59	0 0.00 0.00 0.00	1 0.30
1	24 7.19 68.57 14.20	11 3.29 31.43 6.67	35 10.48
2	93 27.84 53.14 55.03	82 24.55 46.86 49.70	175 52.40
3	43 12.87 43.43 25.44	56 16.77 56.57 33.94	99 29.64
4	8 2.40 33.33 4.73	16 4.79 66.67 9.70	24 7.19
Total	169 50.60	165 49.40	334 100.00

Frequency Missing = 3

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e3 by group

e3 group

Frequency Percent Row Pct Col Pct	0	1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	1 0.30 33.33 0.58	2 0.59 66.67 1.20	3 0.89
2	12 3.56 27.91 7.02	31 9.20 72.09 18.67	43 12.76
3	64 18.99 47.41 37.43	71 21.07 52.59 42.77	135 40.06
4	93 27.60 60.00 54.39	62 18.40 40.00 37.35	155 45.99
Total	171 50.74	166 49.26	337 100.00

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e4 by group

e4 / group Frequency Percent Row Pct Col Pct	0	1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	2 0.59 100.00 1.17	0 0.00 0.00 0.00	2 0.59
2	28 8.31 62.22 16.37	17 5.04 37.78 10.24	45 13.35
3	77 22.85 49.04 45.03	80 23.74 50.96 48.19	157 46.59
4	63 18.69 47.73 36.84	69 20.47 52.27 41.57	132 39.17
Total	171 50.74	166 49.26	337 100.00

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e5 by group

e5 / group Frequency Percent Row Pct Col Pct	0	1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	10 2.97 66.67 5.85	5 1.48 33.33 3.01	15 4.45
2	74 21.96 67.89 43.27	35 10.39 32.11 21.08	109 32.34
3	61 18.10 43.88 35.67	78 23.15 56.12 46.99	139 41.25
4	25 7.42 34.25 14.62	48 14.24 65.75 28.92	73 21.66
Total	171 50.74	166 49.26	337 100.00

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e6 by group

e6 / group Frequency Percent Row Pct Col Pct	0	1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	0 0.00 0.00 0.00	1 0.30 100.00 0.60	1 0.30
2	18 5.34 52.94 10.53	16 4.75 47.06 9.64	34 10.09
3	92 27.30 54.12 53.80	78 23.15 45.88 46.99	170 50.45
4	60 17.80 45.80 35.09	71 21.07 54.20 42.77	131 38.87
Total	171 50.74	166 49.26	337 100.00

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e7 by group

e7 / group Frequency Percent Row Pct Col Pct	0	1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	12 3.56 48.00 7.02	13 3.86 52.00 7.83	25 7.42
2	60 17.80 38.71 35.09	95 28.19 61.29 57.23	155 45.99
3	81 24.04 65.85 47.37	42 12.46 34.15 25.30	123 36.50
4	17 5.04 51.52 9.94	16 4.75 48.48 9.64	33 9.79
Total	171 50.74	166 49.26	337 100.00

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e8 by group

e8 / Frequency / Percent / Row Pct / Col Pct	group 0	group 1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	21 6.23 72.41 12.28	8 2.37 27.59 4.82	29 8.61
2	72 21.36 59.02 42.11	50 14.84 40.98 30.12	122 36.20
3	62 18.40 45.26 36.26	75 22.26 54.74 45.18	137 40.65
4	15 4.45 31.25 8.77	33 9.79 68.75 19.88	48 14.24
Total	171 50.74	166 49.26	337 100.00

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e9 by group

e9 / group Frequency Percent Row Pct Col Pct	0	1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	13 3.87 81.25 7.60	3 0.89 18.75 1.82	16 4.76
2	61 18.15 55.45 35.67	49 14.58 44.55 29.70	110 32.74
3	70 20.83 47.62 40.94	77 22.92 52.38 46.67	147 43.75
4	26 7.74 41.94 15.20	36 10.71 58.06 21.82	62 18.45
Total	171 50.89	165 49.11	336 100.00

Frequency Missing = 1

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e10 by group

e10 / Frequency, Percent, Row Pct, Col Pct	group 0	group 1	Total
0	2 0.60 100.00 1.17	0 0.00 0.00 0.00	2 0.60
1	17 5.06 65.38 9.94	9 2.68 34.62 5.45	26 7.74
2	91 27.08 55.83 53.22	72 21.43 44.17 43.64	163 48.51
3	51 15.18 45.95 29.82	60 17.86 54.05 36.36	111 33.04
4	10 2.98 29.41 5.85	24 7.14 70.59 14.55	34 10.12
Total	171 50.89	165 49.11	336 100.00

Frequency Missing = 1

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e11 by group

e11 / group Frequency Percent Row Pct Col Pct	0	1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	3 0.89 75.00 1.75	1 0.30 25.00 0.61	4 1.19
2	33 9.82 54.10 19.30	28 8.33 45.90 16.97	61 18.15
3	88 26.19 47.83 51.46	96 28.57 52.17 58.18	184 54.76
4	46 13.69 53.49 26.90	40 11.90 46.51 24.24	86 25.60
Total	171 50.89	165 49.11	336 100.00

Frequency Missing = 1

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e12 by group

e12 / Frequency / Percent / Row Pct / Col Pct	group 0	group 1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	1 0.30 25.00 0.58	3 0.89 75.00 1.81	4 1.19
2	17 5.04 44.74 9.94	21 6.23 55.26 12.65	38 11.28
3	81 24.04 46.29 47.37	94 27.89 53.71 56.63	175 51.93
4	71 21.07 59.66 41.52	48 14.24 40.34 28.92	119 35.31
Total	171 50.74	166 49.26	337 100.00

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e13 by group

e13 / Frequency / Percent / Row Pct / Col Pct	group 0	group 1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	8 2.37 50.00 4.68	8 2.37 50.00 4.82	16 4.75
2	75 22.26 55.15 43.86	61 18.10 44.85 36.75	136 40.36
3	65 19.29 46.76 38.01	74 21.96 53.24 44.58	139 41.25
4	22 6.53 48.89 12.87	23 6.82 51.11 13.86	45 13.35
Total	171 50.74	166 49.26	337 100.00

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e14 by group

e14 (Frequency / Percent / Row Pct / Col Pct)	group 0	group 1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	20 5.93 64.52 11.70	11 3.26 35.48 6.63	31 9.20
2	77 22.85 46.39 45.03	89 26.41 53.61 53.61	166 49.26
3	62 18.40 55.36 36.26	50 14.84 44.64 30.12	112 33.23
4	11 3.26 40.74 6.43	16 4.75 59.26 9.64	27 8.01
Total	171 50.74	166 49.26	337 100.00

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e15 by group

e15 / group — Frequency, Percent, Row Pct, Col Pct	0	1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	59 17.51 52.68 34.50	53 15.73 47.32 31.93	112 33.23
2	91 27.00 50.00 53.22	91 27.00 50.00 54.82	182 54.01
3	16 4.75 44.44 9.36	20 5.93 55.56 12.05	36 10.68
4	4 1.19 66.67 2.34	2 0.59 33.33 1.20	6 1.78
Total	171 50.74	166 49.26	337 100.00

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e16 by group

e16 / group Frequency Percent Row Pct Col Pct	0	1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	43 12.76 54.43 25.15	36 10.68 45.57 21.69	79 23.44
2	87 25.82 49.15 50.88	90 26.71 50.85 54.22	177 52.52
3	35 10.39 52.24 20.47	32 9.50 47.76 19.28	67 19.88
4	5 1.48 38.46 2.92	8 2.37 61.54 4.82	13 3.86
Total	171 50.74	166 49.26	337 100.00

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e17 by group

e17 / group Frequency Percent Row Pct Col Pct	0	1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	3 0.89 60.00 1.75	2 0.59 40.00 1.20	5 1.48
2	33 9.79 48.53 19.30	35 10.39 51.47 21.08	68 20.18
3	76 22.55 53.90 44.44	65 19.29 46.10 39.16	141 41.84
4	58 17.21 47.54 33.92	64 18.99 52.46 38.55	122 36.20
Total	171 50.74	166 49.26	337 100.00

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e18 by group

e18 / group Frequency Percent Row Pct Col Pct	0	1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	4 1.19 80.00 2.34	1 0.30 20.00 0.60	5 1.48
2	30 8.90 53.57 17.54	26 7.72 46.43 15.66	56 16.62
3	72 21.36 48.65 42.11	76 22.55 51.35 45.78	148 43.92
4	64 18.99 50.39 37.43	63 18.69 49.61 37.95	127 37.69
Total	171 50.74	166 49.26	337 100.00

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e19 by group

e19 / group Frequency Percent Row Pct Col Pct	0	1	Total
0	1 0.30 50.00 0.58	1 0.30 50.00 0.60	2 0.59
1	22 6.53 64.71 12.87	12 3.56 35.29 7.23	34 10.09
2	58 17.21 50.43 33.92	57 16.91 49.57 34.34	115 34.12
3	68 20.18 45.95 39.77	80 23.74 54.05 48.19	148 43.92
4	22 6.53 57.89 12.87	16 4.75 42.11 9.64	38 11.28
Total	171 50.74	166 49.26	337 100.00

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e20 by group

e20 / Frequency / Percent / Row Pct / Col Pct	group 0	group 1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	9 2.68 64.29 5.26	5 1.49 35.71 3.03	14 4.17
2	29 8.63 51.79 16.96	27 8.04 48.21 16.36	56 16.67
3	60 17.86 43.48 35.09	78 23.21 56.52 47.27	138 41.07
4	72 21.43 56.69 42.11	55 16.37 43.31 33.33	127 37.80
Total	171 50.89	165 49.11	336 100.00

Frequency Missing = 1

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e21 by group

e21 / Frequency / Percent / Row Pct / Col Pct	group 0	group 1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	1 0.30 20.00 0.58	4 1.19 80.00 2.41	5 1.48
2	34 10.09 44.74 19.88	42 12.46 55.26 25.30	76 22.55
3	97 28.78 52.72 56.73	87 25.82 47.28 52.41	184 54.60
4	38 11.28 53.52 22.22	33 9.79 46.48 19.88	71 21.07
Total	171 50.74	166 49.26	337 100.00

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e22 by group

e22 / Frequency, Percent, Row Pct, Col Pct	group 0	group 1	Total
0	1	0	1
	0.30	0.00	0.30
	100.00	0.00	
	0.58	0.00	
1	4	1	5
	1.19	0.30	1.48
	80.00	20.00	
	2.34	0.60	
2	55	65	120
	16.32	19.29	35.61
	45.83	54.17	
	32.16	39.16	
3	86	74	160
	25.52	21.96	47.48
	53.75	46.25	
	50.29	44.58	
4	25	26	51
	7.42	7.72	15.13
	49.02	50.98	
	14.62	15.66	
Total	171	166	337
	50.74	49.26	100.00

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e23 by group

e23	group		
Frequency Percent Row Pct Col Pct	0	1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	30 8.90 51.72 17.54	28 8.31 48.28 16.87	58 17.21
2	91 27.00 49.19 53.22	94 27.89 50.81 56.63	185 54.90
3	42 12.46 55.26 24.56	34 10.09 44.74 20.48	76 22.55
4	7 2.08 41.18 4.09	10 2.97 58.82 6.02	17 5.04
Total	171 50.74	166 49.26	337 100.00

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e24 by group

e24 / group: Frequency, Percent, Row Pct, Col Pct	0	1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	13 3.86 46.43 7.60	15 4.45 53.57 9.04	28 8.31
2	64 18.99 42.38 37.43	87 25.82 57.62 52.41	151 44.81
3	76 22.55 58.02 44.44	55 16.32 41.98 33.13	131 38.87
4	17 5.04 65.38 9.94	9 2.67 34.62 5.42	26 7.72
Total	171 50.74	166 49.26	337 100.00

Elective Course Ranking by Educators (0) and Practitioners (1)

(4) Extremely Important
(3) Important
(2) Somewhat Important
(1) Not at all Important

The FREQ Procedure
Table of e25 by group

e25 / Frequency / Percent / Row Pct / Col Pct	group 0	group 1	Total
0	1 0.30 100.00 0.58	0 0.00 0.00 0.00	1 0.30
1	8 2.37 72.73 4.68	3 0.89 27.27 1.81	11 3.26
2	51 15.13 53.13 29.82	45 13.35 46.88 27.11	96 28.49
3	79 23.44 50.32 46.20	78 23.15 49.68 46.99	157 46.59
4	32 9.50 44.44 18.71	40 11.87 55.56 24.10	72 21.36
Total	171 50.74	166 49.26	337 100.00

APPENDIX K

Undelivered Surveys

Gender of Respondent Male = 1 Female = 2

Region = of USA Reference Appendix

For Program and school reference Appendix M

Educators Returned Surveys not filled out or with E-mail responses

Respondent Number	Gender	Program Type	School	Region	State	
238	1	61	74	5	WV	No Longer Teaching
239	1	63	73	5	NC	No Longer Teaching
240	1	63	73	6	TN	Not coordinator in safety
241	1	63	73	7	LA	No Longer Teaching
242	1	63	73	4	NE	No Longer Teaching
243	1	63	73	1	CT	Returned Undeliverable
244	1	63	72	3	WI	Returned Undeliverable

Practitioners Survey Returned not filled out.

Respondent Number	Gender	Position	Industry	Region	State	
235	1	84	91	5	MD	
236	1	83	91	9	CA	

SURVEY RETURNED UNDELIVERABLE

Respondent Number	Gender	Position	Industry	Region	State	
237	1	83	91	3	MI	
238	1	81	91	3	WI	
239	1	81	91	3	WI	
240	2	81	92	2	PA	
241	2	81	92	9	WA	
242	1	81	91	9	CA	
243	1	81	91	5	MD	Retired
244	1	81	91	3	WI	Sick

APPENDIX L

(L 1) Table of Gender by respondent/ non-respondent educators

(L 2) Table of Gender by respondent/ non-respondent practitioners

(L 3)Table of tech group of respondent/ non-respondent total sample

TABLE L 1

Table of gender by respondent-non-respondent for EDUCATORS

The FREQ Procedure

Male = 1
Female = 2

Responder = 1
Non responder = 0

Table of gender by respond

gender / respond (Frequency, Percent, Row Pct, Col Pct)	0	1	Total
1	60 25.32 28.04 90.91	154 64.98 71.96 90.06	214 90.30
2	6 2.53 26.09 9.09	17 7.17 73.91 9.94	23 9.70
Total	66 27.85	171 72.15	237 100.00

TABLE L 2

Table of gender by respondent-non-respondent for PRACTITIONERS

The FREQ Procedure

Male = 1
Female = 2

Responder = 1
Non responder = 0

Table of gender by respond

gender / respond (Frequency, Percent, Row Pct, Col Pct)	0	1	Total
1	52 22.22 26.26 76.47	146 62.39 73.74 87.95	198 84.62
2	16 6.84 44.44 23.53	20 8.55 55.56 12.05	36 15.38
Total	68 29.06	166 70.94	234 100.00

TABLE L 3

Tech group by respondent non respondent for total sample

The FREQ Procedure

Table of tech group by respondent

techgp	Frequency Percent Row Pct Col Pct	respondent: Non Respond 0	Respond 1	Total
Non Tech	0	43 9.23 26.06 32.09	122 26.18 73.94 36.75	165 35.41
Tech	1	91 19.53 30.23 67.91	210 45.06 69.77 63.25	301 64.59
	Total	134 28.76	332 71.24	466 100.00

Frequency Missing = 5

APPENDIX M

Coding System

Region
Educator programs and school housed

Practitioner positions and industry

Educator program technical or non-technical

Industry practitioner technical or non-technical

NT = Non-technical T = Technical

<u>Coding Used to determine **Educators Program** at their institution</u>

NT	61	=	Safety and Health Management
T	62	=	Construction
T	63	=	Technical / Engineering
T	64	=	Industrial Hygiene / Environmental

<u>Coding Used to determine **School** Educators were **housed** at their Institution</u>

71	=	Health and Sciences
72	=	Education
73	=	Engineering and Technology
74	=	Business

<u>Coding Used to determine **Practitioners** Type of **Position**</u>

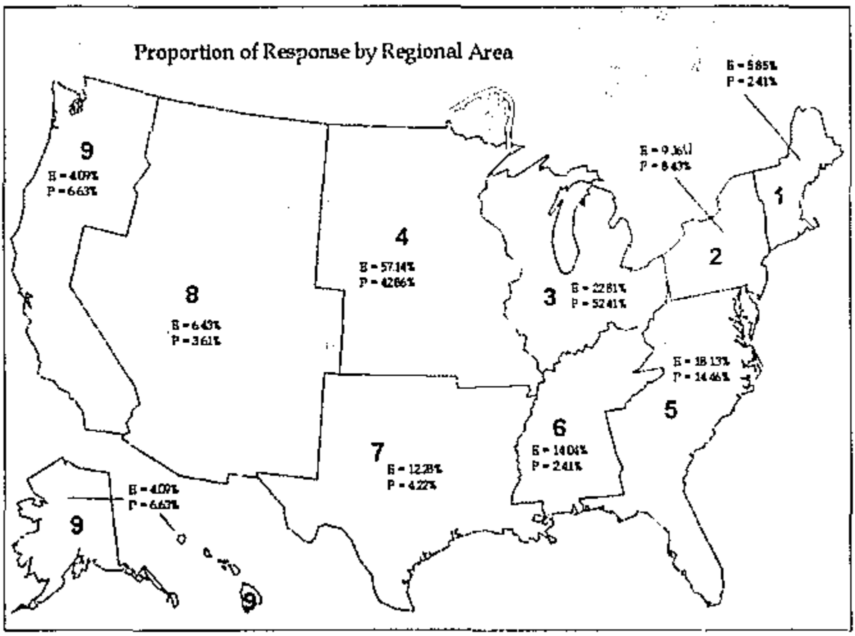
NT	81	=	Safety and Health Management
T	82	=	Construction
T	83	=	Technical / Engineering
T	84	=	Hygiene / Environmental

<u>Coding Used to determine Practitioners Type of Business or **Industry**</u>

91	=	Manufacturing
92	=	Institutional (Schools, Government, Hospitals)
93	=	Utilities
94	=	Consulting (Including Insurance)

United States Regional Area

CT	1	IA	4	AL	6	AK	9
MA	1	KS	4	KY	6	CA	9
ME	1	MN	4	MS	6	HI	9
NH	1	MO	4	TN	6	OR	9
RI	1	ND	4	AR	7	WA	9
VT	1	NE	4	LA	7		
PA	2	SD	4	OK	7		
NJ	2	DC	5	TX	7		
NY	2	DE	5	AZ	8		
IL	3	FL	5	CO	8		
IN	3	GA	5	ID	8		
MI	3	MD	5	MT	8		
OH	3	NC	5	NM	8		
WI	3	SC	5	NV	8		
		VA	5	UT	8		
		WV	5	WY	8		



REFERENCES

Agresti, A. (1996). An Introduction to Categorical Data Analysis Using Ridits (mean rank sums) to assign scores to categories. New York: Wiley Interscience

Adams, S. J. (2000 June). Today's Safety Professional: Manager or Engineer, Professional Safety 24-27. Des Plaines, IL.

A Nationwide Survey of the Occupational Safety and Health Workforce, (1978). DEHS (NIOSH), Publication 78-164, p 1

Amato, C.J. (1998) The World's Easiest Guide to Using the APA (2nd ed.). Westminster, CA: Stargazer Publishing Company.

American Society of Safety Engineers (1994). Scope and Functions of the Professional Safety Position [Brochure]. Des Plaines, IL..

American Society of Safety Engineers (1996). Scope and Functions of the Professional Safety Position. [on-line]. Available WWW :http:// www.asse.org/hscop.htm.

American Society of Safety Engineers (2000). Careers In Safety. [on-line]. Available WWW: http://www.asse.org/hcare.htm.

American Psychological Association Publication Manual (4th ed.). (1994). Washington, D.C.: American Psychological Association.

Anderson, D.R., Sweeney, D.J., Williams, T.A. (1990). Statistics for Business and Economics (4th ed.). St Paul MN.: West Publishing Company.

Anton, T. J. (1989). Occupational Safety and Health Management (2nd ed.). New York: McGraw Hill Book Company.

Asfahl, C. R. (1984). Industrial Safety and Health Management Englewood Cliffs NJ.: Prentice-Hall, Inc..

Ashford, N.A. & Caldart, C.C. (1991). Technology, Law, And The Working Environment.. New York: Van Nostrand Reinhold.

Babbie, E.R. (1992). The Practice of Social Research (6th ed.) Belmont California: Wadsworth Publishing Company.

Bird, F. E. & Germain, G. L., (1986). Practical Loss Control Leadership. Loganville, GA.: Institute Publishing.

Blair,E. H.(1997). Occupational Safety and Health Competencies as perceived by Certified Safety Professionals and Safety Educators, Doctoral Dissertation. Lexington, KY: University of Kentucky.

Brauer, R. L.(1994). Safety and Health for Engineers New York: Van Nostrand Reinhold.

Brauer, R.L. (1992, Sept.). Educational Standards for Safety Professionals Professional Safety,16-21 Des Plaines, IL.

Brown, D.B. (1976) System Analysis and Design For Safety Englewood Cliff, N.J. : Prentice-Hall Inc..

Bross, I. D. J. (1958). How To Use RIDIT Analysis. Biometrics. 14, 18-38.

Bross, I. D. J. (1960). How To Cut The Highway Toll In Half In The Next Ten Years. Public Health Reports. 75, 573-581.

Carruthers, J. B. (1996). Charting a Course to Success Professional Development Conference and Exposition Proceedings 55-66. Des Plaines, IL.: American Society of Safety Engineers.

Christensen, W.C. & Manuele, F.A. (Eds.).(1999). Safety Through Design. Itasca, IL.: National Safety Council. Press Product No. 15146-0000

Curricula Guidelines for Baccalaureate Degree Programs in Safety,(1981). BCSP Technical Report No. Two, Savoy, IL: Board of Certified Safety Professionals.

Dalkey, N.C., (1969). The Delphi Method: An Experimental Study of Group Opinion. New York: Rand Corporation, RM-5888-PR, 16.

Davis, G.B.& Parker C.A. (1997). Writing the Doctoral Dissertation: A Systematic Approach. (2nd ed.). Hauppauge, New York:Barron's Educational Series Inc..

Della-Giustina, D.E., (1996). Safety and Environmental Management . New York: Van Nostrand Reinhold.

DeReamer, R. (1958). Modern Safety Practices . New York: John Wiley and Sons.

DeReamer, R. (1980). Modern Safety and Health Technology New York: John Wiley and Sons.

Dillon, C. (1985). Corporate Safety Manager Performance Expectations, Doctoral Dissertation, Morgantown, W.Va.: West Virginia University.

Dorner, W.W. (1997). Simple box-and-whisker plots. [on-line]. Available WWW: http://www.qualitydigest.com/oct97/htm/excel.html.

Erickson, J.A. (1991, Dec.). Occupational Safety and Health Professionals A University of Southern California Study. Professional Safety 33-38 Des Plaines IL.

Ferry, T.S. (1973). A paradigm for Designing a Safety Curriculum in American Higher Education, Doctoral Dissertation. Los Angeles, CA.: University of Southern California.

Ferry, T.S. (Ed) (1985). New Directions In Safety. Des Plaines, IL.: American Society of Safety Engineers.

Ferry, T.S. & Weaver, D.A. (Eds.) (1976). Directions In Safety. Springfield, IL.: Charles C. Thomas.

Ferguson, L.H. (1995, Nov.). Baccalaureate Safety Curricula: A Survey of Practitioners. Professional Safety 44- 48. Des Plaines IL.

Gay, L.R. (1981).Educational Research Competencies for Analysis Application (2nd ed.). Columbus, Ohio: Charles E. Merrill Publishing Co..

Goetsch, D.L.(1993). Industrial Safety and Health In The Age of High Technology For Technologist, Engineers and Managers. . New York: Merrill an imprint of Macmillan Publishing Company.

Gordon, H.M. (1976) A critical Look At The Safety Management Function Hazard Control Manager, (2000 Spring) Rockville, MD.:Board of Certified Hazard Control Management.

Graduate School (2000). Doctoral, Masters and Honours Research Handbook Perth Western Australia: Edith Cowan University Graduate School.

Grimaldi, J.V. & Simonds, R.H. (1989). Safety Management (5th ed.). Homestead, IL.: Irwin.

Guilford, J.P. (1950). Fundamental Statistics in Psychology and Education (2nd ed.). New York: McGraw-Hill Book Company, Inc..

Hammer, W. (1981). Occupational Safety Management and Engineering (2nd ed.) Englewood Cliffs, NJ.: Prentice-Hall, Inc..

Hanneman, R.A. (1996, October). Two-Way Crosstabulation Example [on-line]. Available WWW: http://www.wizard.ucr.edu/~rhannema/soc271/ctab2.html.

Hansen, Earl. E. & Murray, Michael F.(1998). Determining Competencies of A Safety Professional. Unpublished paper, DeKalp, IL.: Northern Illinois University.

Heinrich, H.W.(1950). Industrial Accident Prevention. (3rd ed.). New York: McGraw-Hill.

Helmrich-Rhodes, L. (1997, March). Comparing U.S. and U.K. – Based Safety and Health Undergraduate Curriculums: How Do We Measure Up? Paper presented at The Best in Safety and Health Educators' Conference. Greensboro, NC: East Carolina University.

Jongeling S.B. (Ed.) (1995, July). Referencing Guide, Office of Research and Development and Division of Academic Services. Perth Western Australia: Edith Cowan University.

Kantor, S., Winkelstein, W., Ibrahim, M. A. (1968). A note on the interpretation of the RIDIT as a quartile rank. American Journal of Epidemiology, 87, 609-615.

Kohn, J.P., Friend, M.A., Winterberger, C.A.(1996). Fundamentals of Occupational Safety and Health. Rockville, MD.: Government Institutes, Inc.

Kolbe-Mims, M.L.(1998). Safety Training and Motivation. Safety Institute of (Western) Australia Journal, North Perth, W.A. winter, 5 (4) 36-40.

Kolbe-Mims, M.L. (1997). Quality of Safety and Health Education. Notes taken at the Safety and Health Educator's Conference, Las Vegas, Nevada.

Laing, P.M.(Ed.)(1992). Accident Prevention Manual for Business & Industry Administration and Programs(10th ed.) Itasca, IL.: National Safety Council.

Lange, F. (1922). Handbook of Safety and Accident Prevention, (Handbook) Columbus, Ohio: Industrial Commission of Ohio.

LeBar, G. (1997 May). Academic Challenge: What Should the Safety Pro Know. Cleveland, Ohio: Occupational Hazards,55-57.

LeBar, G. (1997 September). More Management, Less Calculus (Editorial). Cleveland, Ohio: Occupational Hazards 8.

LeClerg, R.E. Ed. (1975 March). Journal of Safety Management, Weaverville, N.C. Vol.5, No.1, 1-2.

Main, B.W. (1999). What do Engineers Really Know About Safety? In Christensen, W.C., and Manuel, F.A., (Eds.). Safety Through Design 49-63. Itasca, IL.: National Safety Council.

Manuele, F. A.(1993, Oct.). On Becoming a Profession Professional Safety. 22-27. Des Plaines, IL: American Society of Safety Engineers.

Mantel, N.(1979). RIDIT Analysis and Related Ranking Procedures. American Journal of Epidemiology, 109 (1), 25-32.

Margolis, B.L.& Kroes, W.H., (Eds.) (1975). The Human Side of Accident Prevention. Springfield, IL.: Charles C. Thomas.

Merriam-Webster's collegiate dictionary (9th ed.). (1986). Springfield, MA: Merriam-Webster Inc..

Mims, A. (1995, June) System Safety in the '90's', Safety Technology 2000 Symposium A Forum for Advanced Study in the Field of Safety Proceedings (p. 234). Des Plaines, IL.: American Society of Safety Engineers.

Mims, A. (1997). The Accreditation Process of Safety Programs, Safety Institute of (Western) Australia Journal, North Perth, Western Australia summer, 5(2) 13-20.

Mims, A. & Kolbe-Mims M.L. (1994). Ergonomics Methodology for Safer Materials Handling, An International Symposium on Ergonomics Proceedings (p.218). Des Plaines, IL. American Society of Safety Engineers.

Minter, S.G. (1992). The 1999 National Safety Survey Occupational Hazards.27-30. Cleveland, Ohio: Penton Media, Inc..

Montgomery, J.F. (1983). The Identification of Entering Competencies for Transportation Safety Professionals. Doctoral Dissertation College Station, TX.: Texas A&M University.

Nord, J. (1995, December). BOX-AND-WHISKER PLOT [on-line]. Available WWW: http://WWW.ellerbruch.nmu.edu/cs255/jnord/boxplot.html.

Occupational Safety and Health Act (OSHAct) (Public Law 91-956) (1970) United States Department of Labor, Washington D.C.: U.S. Government Printing Office.

Peterson, D. (1978). Techniques of Safety Management (2nd ed.). New York: McGraw-Hill Book Company.

Polit, D.F. & Hungler B. (1991). Nursing Research, Princiles and Methods (4th ed.) Philadelphis, PA.: J.B.Lippincott Company.

Richardson J.E. (1997, June). Safety Analysis of Day-to-Day Operations. Professional Development Conference and Exposition Proceedings. (p. 358). Des Plaines IL.: American Society of Safety Engineers.

Rockwell, T. (1962 February). Design Specifications for a Safety Engineer, Professional Safety, (pp.16-19) Des Plaines IL. :American Society of Safety Engineers.

SAS Institute Inc. SAS Campus Drive Cary, NC 27513-2414 USA What's New in Data Analysis? Sample Survey Design and Analysis[online] June, 2000 Available WWW: http://www.sas.com/rnd/app/da/new/dasurvey.html

Schaechtel, D (1998, June) Building Your Safety Management System. Professional Development Conference and Exposition Proceedings (p 24) Des Plaines, IL.: American Society of Safety Engineers.

Seiden, M.R.(1989). Product Safety Engineering for Managers Auburn Hills, MI.: UMW-GM Center for Health and Safety

Selvin, S.(1977). A Further Note on the Interpretation of RIDIT Analysis. American Journal of Epidemiology, 105, 16-20.

Sermeus, W., & Delesis, L. (1996 June). Ridit analysis on ordinal data. [on-line] Western Journal of Nursing Research, NUR 390: Library Resources Electronic Readings. V18 n3 p.351(9). Available WWW: http://www. nau.edu.library/courses/nursing/nur390/reserve/riditanalysis.htm.

Shah, D. T. (1997, March). Internationalizing the Safety Curriculum, In M. Friend et al (Chair) Proceedings Occupational Safety and Health Educators' Conference Greensboro, NC: East Carolina University.

Slavin, T.J. (1998, March). Discussing National Safety Management's Objective. In M. Friend et al (Chair) Proceedings Occupational Safety and Health Educators' Conference Greensboro, NC:East Carolina University.

Soule, R.D. (1993). Perceptions of an Occupational Safety Curriculum by Graduates, Their Employers and Their Faculty. Doctoral Dissertation. Pittsburgh, PA.: University of Pittsburgh.

Spitzer, R. L., Fleiss, J. L., Kernohan, W., Lee, J., and Baldwin, I. T. (1965). The mental status schedule: Comparing Kentucky and New York schizophrenics. Archives of General Psychiatry, 12, 448-455.

Stockton, J.R.,Clark, C.T. (1975). Introduction to Business and Economic Statistics (5th ed.). Cincinnati, Ohio: South-Western Publishing Co..

Stokes, M.E., Davis, C.S., Koch, G.G. (1995), Categorical Data AnalysisUsing The SAS System, Cary, NC: SAS Institute Inc.

Tarrants, W.E., (1963). Scope and Functions of the Safety Professional [Pamphlet]. Des Plaines, IL: American Society of Safety Engineers.

Tarrants, W.E. (1980) The Measurement of Safety Performance. Madison Avenue, New York: Garland STPM Press.

Tarrants, W.E., (1983 January). Suggested Core Curriculum for the Occupational Safety And Health Professional . [Report]. Des Plaines, IL : American Society of Safety Engineers Academic Accreditation Council.

Taylor, G., Hegney, R., Easter, K., (1996) Enhancing Safety, An Australian Workplace Primer. Perth, Western Australia: TAFE Publications.

Trebswether, S.(Ed.) (2000 September) CSP exam to change in 2001. Professional Safety 3. Des Plaines, IL: American Society of Safety Engineers.

Vernon, R.J.(1980). Curricula Development and Examination Study Guidelines, BCSP Technical Report No. One, Savoy, IL.: Board of Certified Safety Professionals.

Widner, J.T. (Ed.) (1973). Selected Readings in Safety, 199-207. Macon, Ga.: Academic Press.

Wilson, J.(1999). Related Investigations on Intermath to Challenge Teachers. [on-line]. Available WWW:http://jwilson.coe.uga.edu/interMath/Main…ath/ Dictionary/Statistics.html.

Wynder, E. L., Bross, I. D. J., Hiroyama, T. A. (1960). A Study of the Epidemiology of Cancer of the Breast. Cancer, 13, 559-601.