ABSTRACT

MACHLES, DAVID LEE. A Qualitative Study of Situated Learning in Occupational Safety (Under the direction of John M. Pettitt).

The purpose of this study was to understand how learning occupational safety practices occurred for employees outside of, and in addition to, what was taught through planned, intentional safety training. The participants reflected upon their personal experiences regarding the work safety practices that they chose to incorporate into their lives during a semi-structured audio taped interview. Data were analyzed using qualitative phenomenological methods to distill the multi-page interview transcriptions into manageable and comparable elements. Theoretical constructs underlying the analysis drew from occupational safety literature and situated learning theories. The analysis found that learning occupational safety practices occurred through experience with equipment and within various environments. These safe work practices are easily transferred to other settings where they are negotiated and become part of the workplace repertoire of safety. The participants did not discern non-workplace and workplace safe practices, but saw safe work practices as a conceptual tool that was applied to all settings. The participants used stories as a vehicle for both learning and sharing safe work practices with co-workers. These stories provided a rich, meaningful way to share safety concepts. The participants learned safe practices through the interaction with co-workers, self-selecting mentors who would provide learning opportunities, and they in turn would become mentors for other co-workers. This learning occurred during and within the daily activities of performing their work within communities of practice.
A QUALITATIVE STUDY OF SITUATED LEARNING IN OCCUPATIONAL SAFETY

by

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Better than a thousand days of diligent study is one day with a great teacher. -Japanese proverb

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CHAPTER ONE

Introduction

Training and education have played a major role in industry since the beginning of the industrial revolution. By providing employees with information and knowledge organizations have succeeded in improving and enhancing workplace performance. With a variety of means available different instructional and teaching strategies are utilized. If the content of the training is well structured and explicit, such as math, science and engineering, a transmission is one alternative. The transmission perspective implies that information and knowledge is provided by a content expert and transmitted to trainees or participants with the expectation that they will learn it. This learned knowledge is then ideally transferred to the workplace and incorporated to become part of the desired performance of daily activities and routines (Pratt, 1998). Unlike other teaching perspectives such as a developmental, nurturing, social reform or apprenticeship approach, the transmission method is often delivered in the form of lecture, discussion, video, slides, and more recently, computer based training (Pratt). Training that utilizes the transmission perspective often uses instructors who are content experts in a specific area of training (Pratt). While there is little doubt that information and knowledge can be successfully transmitted to employees and then transferred to the workplace, there are circumstances where transmission alone has limitations on producing the desired performance outcomes (Broad and Newstrom, 1992; O’Driscoll, 1999; Pratt, 1998).

Under certain circumstances in the workplace, learning that occurs as a result of transmission teaching is often based on assumptions that may require further examination.
The first assumption is that workplace teaching leads to learning and the second is that this learning in turn, leads to behavior or performance change (O’Driscoll, 1999). Barriers to transfer within the workplace (from teacher to learner, and from learner to work setting) can, and often do, exist. Developing transfer strategies to overcome these barriers has recently been the focus of considerable analysis and research. Transfer strategies, when used, have done a great deal to increase the transfer of knowledge, skills and attitude objectives of training from the classroom to the work environment (Broad & Newstrom, 1992).

Occupational safety is an example of a discipline that, to a large extent, has relied on the transmission method of teaching (Institute of Medicine, 2000). Safety professionals, as content experts, often design and deliver safety training to employees. This profession has accumulated a great quantity of knowledge regarding the understanding and control of workplace safety hazards. Yet, despite all the available knowledge, training and education that is provided in this field, there continues to be work related injuries, illnesses and deaths. Clearly, providing information and increasing knowledge alone does not result in the desired performance or behavior outcomes; for if we accept the idea that people seek personal safety (Maslow, 1968), why then have they not taken this important safety information that has been so abundantly offered and apply it to their day-to-day activities?

Situated learning theory maintains that learning occurs through everyday social activities within everyday settings. Perhaps situated learning is a more reliable source of safety information for the working employee. While safety professionals and trainers grapple with overcoming barriers that impede training transfer, perhaps within the actual workplace employees are exposed to more accessible, consistent and perhaps realistic learning
opportunities from everyday experiences and opportunities. These everyday learning opportunities, while perhaps unintentional, may be more credible and perhaps comprehensible to the employees than what is being provided through structured, intentional safety training (Marsick & Watkins, 2001).

In recent years situated learning theory has attracted the attention of a number of educational researchers (Billett, 2001; Lave, 1988; Lave & Wenger, 1991; Wilson, 1993). This theory implies that people learn through the actions they encounter in everyday situations. The theory clearly focuses on the process of learning and is not, as Lave asserts, a general teaching approach (Lave & Wenger, 1991). Situated learning contends that people learn through contextual social interaction with others, within learning communities or communities of practice such as the workplace or professional organization. Meaning or learning is mutually negotiated with other members or participants in the community of practice (Billett, 2001; Lave, 1988; Lave & Wenger, 1991; Wenger, 1998). New participants in the workplace community of practice learn initially by observation and minimal, yet active participation. As their comfort levels increase and the new environment begins to make sense, they learn. Their level of participation and learning increases as they move from peripheral to a more central role of participation. Since again, this is a learning theory and not a teaching theory, it is believed that situated learning occurs through an ongoing basis in everyday activities such as work. As a result this learning is occurring whether teachers want it to or not.

Few teaching perspectives are based on situated learning theory because it is more learner-centered and less teacher-centered. In other words it allows for the learner to have as
much control in the educational process as the teacher. The most common teaching perspective founded on a learner-centered theory is apprenticeship (Pratt, 1998). A learner-centered or apprenticeship perspective is uncommon in today’s workplace with the exception of some crafts and professions such as medicine and police work. However, current work by such researchers as Senge (1994) and Marsick & Watkins, 2001), to name a few, espouse a learner-centered framework in the development of learning organizations.

Problem Statement

While occupational safety professionals continue to provide transmission based teaching, situated learning theory maintains that other meaningful and concurrent learning is taking place. This learning occurs as people interact with others within the workplace. It occurs as they make meaning of the historical, political, cultural, and social aspects of the workplace they encounter moving from peripheral to central participation (Billett, 2001; Lave & Wenger, 1991; Wenger, 1998).

Given that situated learning through legitimate peripheral participation takes place in the workplace, how does it contribute to employee’s learning regarding safe work practices in contrast to traditional workplace training? If learning does occur regularly through everyday activities within the workplace is it possible that this unintentional, yet meaningful learning, enhances or detracts from the curriculum that is being taught in the classroom?

Limited research has been conducted to show the impact of unintentional, situated learning within the workplace. Most research has compared what might be considered the
attempted application of situated learning to more traditional teaching methods in primary education. As discussed in chapter two, many of these studies use teacher controlled simulation rather than situated learning as comparison (Griffin & Griffin, 1996; Hendricks, 2001).

If situated learning is a major source of knowledge for employees, then perhaps it is not that the employee is unable to transfer the learning that is being taught in the classroom, but rather that the other learning affordances in the workplace are more influential and have greater opportunity to provide an education within the workplace community of practice. A common belief of many safety professionals and trainers is that performing the learned safe practices is failing due to barriers to training transfer (Broad & Newstrom, 1992), when perhaps the unintended situated learning is providing a more robust, meaningful, and realistic education for employees. In other words, situated learning may be how employees come to understand, accept, and choose the safe practices and behaviors that they believe are important in maintaining their safety in the jobs they perform.

Purpose of the Study

The purpose of this study was to understand how learning occupational safety practices occurred for employees outside of, and in addition to, what was taught through planned, intentional safety training. To accomplish this it was important to understand how employees selected the safe work concepts they believe were important and then to understand how they in turn learned the safe or unsafe work practices they believe to be
important and decided to incorporate into their work lives. This will provide insight into how they have come to see these work practices as important within the context of their employment and why they have chosen to make them a part of their personal ontogeny.

By conducting in depth interviews with employees at the selected company, the research attempted to provide insight into how employees learned and assimilated what is needed to perform their job well and to perform it safely, aside from what they were instructed through formal training programs. By exploring holistically how employees learn through the daily activities of the workplace environment, safety professionals, managers and trainers will have a better understanding of how to possibly improve performance by fostering and amplifying this type of real life learning rather than just focusing on ways to overcome the barriers the environment creates through transfer strategies. This will help in possibly establishing more robust learning opportunities for employees, and also assist, redefine, and clarify the role of the safety professional and trainer within certain settings and organizations. This information would be particularly useful since The National Institute for Occupational Safety and Health (NIOSH) is presently seeking ways to increase the effectiveness of safety training. Examples of methods currently being explored by NIOSH include toolbox training for construction workers and farm workers. By understanding how employees choose the safe practices they actually incorporate into their daily lives, curriculums for safety training could be developed that embed these situated learning opportunities into the workplace. There is potential that these learning opportunities could play a significant role in employee learning and establishing safe work practices, resulting in a decrease in occupational injuries and illnesses. There is clear recognition in the
occupational safety profession that improvements and new concepts in training need to be explored (Institute of Medicine [IOM] 2000), and by exploring how actual day-to-day learning occurs new avenues would be explored that could foster this type of learning.

Rationale for the Study

Since very little research has been conducted to show the impact of situated or unintentional learning on workplace safety, a qualitative approach to the study was selected. First it is important to establish if this type of learning is occurring. Secondly, if situated learning does occur and does play a role in workplace safety, a qualitative approach may help in understanding what role it plays, and how it impacts workplace safety. To answer these questions, the researcher sought to understand the participants’ perception of learning. McCracken (1988) states, “Qualitative methods are most useful and powerful when they are used to discover how the respondent sees the world” (p. 21).

Occupational safety was selected as the topic to be explored for a number of reasons, although these reasons may denote significant assumptions and biases. First, despite his or her culture or personal background, personal safety, unlike perhaps other characteristics of work such as quality or performance, is universally accepted as being important to most people (Maslow, 1968). While someone may knowingly choose not to perform at his or her personal best, with the exception of those suffering a psychological pathology, few people will choose to work in a way that will knowingly cause them personal harm. That is not to say that people will not knowingly perform at risk behaviors (Geller, 1996). While a person
may choose to operate a saw without proper guarding (at risk behavior), they would never actually choose to put their hand onto the moving saw blade.

Secondly, safety may be considered tacit knowledge. It is the manner in which a job is done not the job task itself. Nearly everyone from the computer operator to the 2-ton press operator will want to perform his or her job tasks in what they believe to be a safe manner. Consequently most people will have developed an established personal concept of what it means to be safe, regardless of the actual task they perform.

Finally, as mentioned, safety training is frequently delivered using a transmission approach. Safety training is available from a multitude of sources. Videos, CDs, DVDs, overhead and slide shows are readily available. Employees at the selected facility will have had some sort of safety “training” at some time during his or her work career, and they will have documentation as to when that training occurred. Also the selected facility is in the business of manufacturing pharmaceuticals. As with all pharmaceutical companies regulated by the Food and Drug Administration (FDA), the “training” must meet certain criteria that include written objectives and delivery by a content expert with explicit credentials. Since the training provided at this facility is consistent in design and delivery, the differences exhibited by employees may be likely attributed to learning in the workplace rather than variations from training in the safety classroom.
Significance of the Study

This study will be significant in that it explored ways in which situated learning occurs in the workplace, rather than learning resulting from various safety teaching methods. More specifically it studied situated learning that results in occupational safety behavior adaptation or change from the learner’s perspective. While this may seem fundamental, there has been very little research in this area, particularly in the field of occupational safety. Cohen and Colligen (1998) conducted an extensive literature review on safety training resulting in categorization of over 80 articles. A number of the publications in this literature review discussed the importance of training and the inclusion of adult learning principles. These principles include making the material relevant, interesting, applicable to the workplace, etc., yet nothing was found that take these principles a step further to arrange them into a general theory on learning as it applies to occupational safety practices. In other words, adult learning principles were viewed as secondary to the training provided, rather than the central theme. This study focused on learning as the central theme rather than teaching, and taken a step further, focused specifically on learning that occurs outside of the classroom setting.

Research Questions

While the purpose of this study was to explore how learning safety actually takes place within the work environment, it was not the intention of this study to discount or minimize the importance of formal or structured safety training. Instead the focus was on
situated learning or learning that occurs through everyday activities outside of, and in addition to, that which occurs in the safety training room. The research questions this researcher explored are:

1) What are the safe practices that people have chosen to incorporate into their lives?

2) Apart from, or in addition to, structured or planned training, how do employees learn the safety practices that they believe are important and have incorporated into their work lives?

Limitations of the Study

This study examined ways in which employees learned about occupational safety through everyday activities outside of the classroom. As such, it was by no means to be an exhaustive analysis of every possible way in which learning occurred outside the classroom. Given the lack of research in this particular area, this study attempted to lay a portion of the foundation for an ongoing analysis regarding situated learning within the workplace. As additional research is completed in this area, a structure will hopefully begin to emerge from a foundation that may have been created through this study.

In addition, the goal of this study was to report ways in which employees learn safety through daily activities, and simply report the learning methods that were utilized, as well as the subjects’ perceptions about the success of these methods. As such, judgments about which strategies are better, or which ones are worse could not be rendered.
Finally, this study may or may not be generalizable to different populations. As Bogden and Biklen (1998) have stated, from a qualitative research perspective there is greater “interest in deriving universal statements of general social processes than statements of commonality between similar settings.” Therefore the concern is not with the “question of whether the findings are generalizable, but rather with the question of to which other settings and subjects they are generalizable” (pp. 32-33).

Definitions of Terms

Community of practice – A social group whose members share a mutual engagement, negotiate a joint enterprise and have developed a shared repertoire (Wenger, 1998).

Ontogeny - the development or course of development especially of an individual organism (Merriam-Webster, 2003).

Safety - the condition of being safe from undergoing or causing hurt, injury, or loss (Merriam-Webster, 2003).

Schema - a mental codification of experience that includes a particular organized way of perceiving cognitively and responding to a complex situation or set of stimuli (Merriam-Webster, 2003).

Situated learning – A theory that suggest that learning is naturally tied to authentic activity, context and culture (Brown, Collins & Duguid, 1989).

In situ - in the natural or original position or place (Merriam-Webster, 2003).
CHAPTER TWO

Literature Review

Introduction

The purpose of this literature review was to provide a framework for the application of employee education and training in the field of occupational safety. Alas, there has been very little research in the area of situated learning and its application to employee workplace learning, and virtually no research in its application to occupational safety. This created difficulty in using previous studies on which to build this research. On the other hand, lack of previous research in this area provided justification for research to begin and it provided an opportunity to open the door and begin building a foundation for future research.

The studies that are available are generally in the area of primary education or in general workplace training. The details of these studies are reviewed later in this chapter. Since little research has been conducted, the core of the literature review is in developing the concept of situated learning. A historical review of safety training reveals a plethora of literature exploring and emphasizing the importance of training and education, yet also is void of applications using a situated learning approach. It is important to explore the historical perspective of safety training to understand how this field’s approach to safety training and education has evolved and examine how this evolution compares to the broader evolution of the workplace and workplace training in general.
Historical Perspective

The Organization

In the Newtonian model of linear thinking the world operated with cause and effect efficiency, and this thinking spread into our adult model of human learning as well. "We became preoccupied with managing our industries, organizations and schools by reducing them to discrete, observable and measurable parts. We believed that by understanding the parts we could determine the behavior of the whole and that analysis would lead to synthesis" (Marshal, 1997, pp. 179-181).

As Capra (1996) explains, “Galileo changed the world’s thinking about science by removing the qualitative and mystical aspects, and restricting it to phenomena that could be measured and quantified. Descartes then created a method of analytical thinking based on taking complex phenomena and breaking it into parts. His belief was that by understanding the behavior of the parts, the behavior of the whole could be understood. Finally, Newton's Grand Synthesis and Newtonian Mechanics allowed for the entire world to function like a perfect machine with mathematical precision. Ultimately, even complex biological concepts like the human circulation could be explained in mechanical terms once chemistry was refined” (pp. 17-34). People’s perceptions about the world transformed from the mystical to the scientific.

Since the entire world thought in Newtonian concepts it would stand to reason that the workplace organization from the beginning of the Industrial Revolution through recent times was assembled and operated as a precise machine as well (Aldridge, 1997; Wheatley,
It was designed, engineered, built and managed like a machine. Factories were filled with assembly lines and equipment designed to manufacture goods or products efficiently. The humans who interfaced with these machines were viewed as extensions of the machines they operated (Aldridge, 1997). The machines were designed and engineered based on Newtonian concepts that demanded they operate with clockwork precision. These machines could be set into motion and as long as they were kept in good repair and maintained, they were expected to operate indefinitely (Wheatley, 1992). If a part broke, it was replaced and the machine continued to run. People, if killed or injured, could be replaced by more people or better yet, new machines (Aldridge, 1997).

*Transmission Training Perspective in the Organization*

These Newtonian principles historically, “have allowed us to view education as a passive and incremental discipline, rather than dynamic or developmental. The focus was on covering content and the reproduction of that content, which we often viewed as more important than genuine understanding. Content segmentation was more highly valued than concept integration, and learning was the acquisition of information, rather than construction of meaning” (Marshal, 1997, pp. 179-181).

Workplace training embraced the Newtonian view of adult learning that was a part of this era. A transmission perspective of training – information transmitted to employees – was the norm. Training during the early Industrial Revolution set the stage for most training that had occurred from that time until recently (Miller, 1996). It molded future workers into
the three most important aspects of industrial work - punctuality, memorization, and taking orders from management without question. This mind set, until recently, has been carried into today's organization where the transmission method of teaching continued to play a major role (O'Driscoll, 1999, p. 60).

The Emergence of Occupational Safety in the Organization

Safety History

Historically, safety training evolved from the same mechanized concepts. Before the 19th century most people employed in the United States worked either as farmers or craftsman. The knowledge and skills regarding these trades were passed from person to person through the process of apprenticeship, or in agriculture from parent to child. The safety of the craft was taught and learned in the same manner and its importance could not be underestimated. The success of one's employment was very dependent upon performing a job safely. By the second half of the 19th century the Industrial Revolution had begun and major changes occurred in the way people worked. Jobs shifted from crafts, trades and farming, to mining, manufacturing and transportation (Aldridge, 1997). With this shift came an entirely new form of work along with unfamiliar hazards and dangers that took employees and employers decades to understand and begin to control. The use of traditional apprenticeship began to fade. In the crafts, people grew up within the occupation to
understand all of the skills that were needed to be successful. In the new industrial setting a specific skill set was needed to operate only a small part of the total craft that required industrial work to be taught in the factory. (Miller, 1996, p. 6)

This new work setting created a variety of hazards that were entirely different from the hazards of the past. First, unlike the small businesses of the past, the new workplaces brought a large number of employees together in factories or mines (Aldridge, 1997). This created a new organization unlike the typical farm or craft shop of the past. These industries were highly automated and this automation, with its complex equipment, was expensive. Consequently, the new mechanized organization created an environment where production and speed was of primary concern. Until this time, the craftsman or farmer set their own pace, quality, and safety standards. The demand for high-speed production ran counter to the ways work had been performed up until this time (Aldridge, 1997).

Secondly, there were now large numbers of workers brought together in these factories. Unlike the slogans of today to the contrary, during this time the automation and production was the most important asset and the laborer was just another cog in the machine. Labor was cheap, expendable and required little skill. While upper management focused on production, the role of "human resource manager" was given to the foreman. He hired and fired at will, and turnover was high (Aldridge, 1997). Immigrants were put to work in factories where a language barrier created additional difficulties. Safety training on the use of equipment was minimal at best, and any safety learning was usually obtained through gruesome experience. Child labor was also common during this time. The 1900 census
showed that there were over 1.75 million working children between the ages of 10 and 15 (Aldridge, 1997).

Finally, death and injuries were generally accepted as being part of “industrial progress” (O'Reilly, 2001, pp. 3-27). Industrial engineering was in its infancy resulting in employees operating machinery that was designed for production, not safety. Employees were often required to operate multiple machines, since a high machine to operator ratio meant higher profits. It was not uncommon to find cotton mills equipped with 400 machines per 100 employees. These machines were usually belt driven and contained multiple unguarded gears. As demands increased, production was “turned-up”, and as the equipment grew in magnitude and speed, the dangers increased. Instead of purchasing larger boilers to meet greater demands, smaller ones were often overheated, causing them to explode (Gersuny, 1981).

The Need for Safety Training and Education

Public out-cry regarding poor working conditions, child labor issues, and state regulations, prompted court rulings that gradually held more employers responsible for injuries and accidents. As a result, the first workers’ compensation (known as workmen’s compensation at the time) program began in 1911 as the Employers’ Liability Law. This established a no fault insurance system where a set amount was paid for injuries in exchange for the employee surrendering their right to sue. With the introduction of these workers’ compensation laws the financial responsibility of injuries were shifted to the employers in the
way of insurance premiums. With this new financial burden and labor unions earning high-risk pay, employers soon had an economic need to develop safety programs, training, and education (O'Reilly, 2001). It was unfortunate, but not surprising, that the concept of safety was originally driven as a means to decrease the cost of doing business. Prevention of death, injury and illness was merely a secondary gain. Also interestingly, these early workers’ compensation laws that forced management to take more responsibility for safety, also forced management to take more control of the employees in general. Management would have been perfectly content to allow employees to maintain responsibility for their own workplace safety as well as working as long as the great machine kept running and production was up. Mandated workplace safety changed all that (Aldridge, 1997).

At the same time occupational health and industrial hygiene issues were also quickly becoming a concern. Through training and adult education, the factory nurses and physicians taught employees good industrial hygiene and how to properly handle these hazards while minimizing their health risk (Gersuny, 1981).

As the correlation between workers’ compensation premiums and safety become more apparent, other organizations were formed that relied heavily on adult education to provide knowledge to engineers regarding safety design. The Association of Iron and Steel Electrical Engineers was organized with much of their attention directed towards safety education and training. National conferences on safety were held where engineering ideas were shared. Issues of safety education emerged as the primary focus with organizations such as the National Safety Council. Much of the early safety education was directed towards the engineer who designed the industrial equipment, and it was found that
engineering changes could be made to equipment and processes to make them safer. As hazards were understood, safety education and training programs increased. Education was also used within the industry to reach the employees, and safety rules were established and enforced. Early efforts to educate employees consisted of posters and signs that warned of the dangers of not wearing safety equipment or following safety rules. Safety committees were formed at companies to identify hazards and educate employees on working safely. The “three E’s of safety”, engineering, education and enforcement, brought about a tremendous decrease in the number of injuries, illnesses and deaths in the occupational setting (O'Reilly, 2001).

Safety training and education continue to be utilized in workplace safety and with the passing of the Occupational Safety and Health (OSH) Act in 1970, training and education became a part of most OSHA standards. The OSH Act also created the National Institute for Occupational Safety and Health (NIOSH) that had education and training as one of its primary roles for both employees and occupational safety professionals.

While employee safety training has made some changes since the OSH Act, the role of the safety professional has changed substantially during this time. Early safety professionals were engineers, chemists, or employees who had a solid understanding or interest in occupational safety. When the importance of workplace safety was realized from a financial standpoint, companies began educating safety specialists in house. This education continued to grow after World War II as technical and community colleges offered associate and technical certificates for the safety professional. These programs were offered to engineers as evening classes in safety. As the profession became established safety engineers
and industrial hygienists began receiving degrees in college and graduate school (O'Reilly, 2001).

**Change in Organizational Perspective**

*Shifting Perspectives*

There is a shifting perspective in organizational paradigm that has occurred since the latter part of the last century, though today many organizations continue to operate using many aspects of the same structured Newtonian and mechanistic paradigm that was ushered in with the industrial era. These organizations can be broken down into functions and employee's jobs described by their roles. Organizational charts show where the parts are and where they fit into the organizational machine. To analyze this type of organizational design, analysts gather extensive data and apply complex mathematical models. By studying the parts we believe we can better understand the whole (Wheatley, 1992).

Wheatley (1992) asserts that even our knowledge has been broken into subjects. She contends that a reductionist perspective has been carried into everything in the last three hundred years (Wheatley, 1992, p.27). All of our current educational system was derived from the needs of the Industrial Revolution and based on the same Newtonian concepts (Marshal, 1997, pp. 179-181).
New Organizational Perspective

According to O’Driscoll (1999), by the 1930s the workers' life had begun to change substantially. With a greater emphasis on workers' rights, workplace training was beginning to focus on human performance. During World War II training was used extensively to teach new employees who had never been in the workplace how to make products, like weapons, for the war effort. After the war employees enjoyed good living outside of work and began to look closer at the jobs they had. The command and control workplace became less attractive as employees saw a gap between their work life and home life. In an attempt to try to keep employees motivated the concepts of McGregor, Maslow and Herzberg were brought to the forefront. Human performance and motivation quickly became the focus. Despite this shift in the perception of work from the early Industrial Revolution to recent times, training in many organizations continued to follow the same formats of the turn of the century.

Something happened, however, that forced organizations to change. Part of that change originated with the human relations movement that began quietly in the 1920s and continued into the 1950s by McGregor, Herzberg and Maslow. These individuals recognized that humans were not machines and could not be treated as such (O'Driscoll, 1999; Rogers, 1994). After World War II Americans were enjoying freedom and financial security outside of the workplace, while the command and control workplace continued. This dissonance created increased dissatisfaction with work (O'Driscoll, 1999, p. 63). “Finally, the economic issues of the 1970s oil crisis and globalization of the marketplace allowed foreign markets to enter the US and deliver a blow to the American auto industry as well as other industries. This was a wake up call for companies that were directing their organizational efforts to
increase production and capacity while ignoring innovation and quality” (O'Driscoll, 1999, p. 21). Consequently the quality movement of the late 1970s and early 1980s resulted in a needed responsiveness of companies forcing them to develop an open system approach. The great industrial machine was no longer going to work in the US and management recognized that a change was needed.

The open system model of the organization was beginning to be realized. “Experts like Demming, who were rejected by corporate America in the 1950s and 1960s, were now being sought in the 1980s” (O'Driscoll, 1999, p. 22). With the quality movement came the recognition that employees and the environment share an integrated partnership in the organization. The old Newtonian machine based model had begun to give way to a complex adaptive systems perspective (Marshal, 1997, p. 179).

This new organization that emerged looked quite different than that of its predecessor of the last century. This change created a new organizational structure where roles and boundaries are not quite as clear. "The old make and sell or command and control organization has been replaced with one where no one commands and no one controls. The new organizations are built on relationships that focus on strategies and teamwork, or they do not survive at all” (Conger, 1997, p 2). The organizations of today are faced with new global issues and a different type of employee as well.

The employees who comprise the team relationships in this new organization have a different perspective on work than those of the generations that preceded it. According to Conger (1997), “today's employee, having experienced a large number of dual career families and parents with record numbers of divorce, have a greater interest in not making their work
the main or only focus of their lives. Many have also experienced either directly or indirectly massive layoffs and downsizing, so consequently their loyalty to one organization is not as strong as previous generations. These employees do not tolerate having people as their bosses, instead they will look for mentors and coaches or teammates” (p.4). These are the players in the new organization.

The Role of Learning and Teaching in the New Organization

According to O’Driscoll (1999) “the work groups and employees of the modern organization will not and cannot be expected to learn in the same fashion that the employees from the past did. The employees of the new organization will have to gather information in a different manner and make decisions based on that information very quickly if they are going to remain competitive. The new learning organization will be an open adaptive system that will link the employee with the outside world. It will create a system between human, machine and the environment” (p. 21).

Garvin (1993) believes these learning organizations are skilled at five main activities; systematic problem solving, experimentation with new approaches, learning from their own experience and past history, learning from the experiences and best practices of others and transferring knowledge quickly and efficiently throughout the organization. While many organizations claim to practice these activities to some degree, few are consistently successful because they rely largely on isolated examples and not expanding the concepts to the entire organization. By creating systems and processes that support these activities and
integrate them into the day-to-day operations companies can manage their learning more effectively (p. 81).

In this open adaptive organization the learning occurs within the environment where the decisions will be made and from within the work experience. This is the heart of organizational learning where the collective process of learning occurs through experience (Marsick, Bitterman, van der Veen, 2000, p.12). In this setting people will have to find a way to make meaning out of the world in which they live and work, a meaning which "exists neither in us, nor in the world, but in the dynamic relation of living in the world (Wenger, 1998, p. 54). This dynamic relation in the real world will create a learning environment that will be less formal than what we are accustomed. Yet the environment will be more complex. The more complex and dynamic the context, the less a social unit can rely on standardized, stable, habitual practices from the past. People experiment with new approaches based on frequent ad hoc assessments of the changing environment. They rely on coherence for flexible informal cultures more than on formal structures (Marsick, et al., 2000, p. 3). In this type of environment meaning will be acquired through observation, modeling and socialization and according to Marsick et al., “this type of learning from experience will be tacit and may not be highly conscious" (2000, p. 12).
The Expanded Role of Training in the New Organization

Not only will this impact how people learn, but according to Koffman and Senge (1995), it is also going to have dramatic effects on those who teach or train and will change our description of teaching. In the organization of the past, the transmission of information was important, or so we thought. But as they point out "the analytical way to address complex problems is to break it into components, study each component in isolation and then synthesize the components back into a whole, but there is something lost in assuming a mechanical structure and ignoring the systematic interactions" (p. 7).

These writers contend (Koffman and Senge, 1995; O’Driscoll, 1999; Wheatley, 1992) that in the past the training model followed this analytical approach where knowledge was a commodity that could be passed along. As Wenger (1998) states, “if we believe for instance that knowledge consists of pieces of information explicitly stored in the brain then it makes sense to package this information in a class where the learners sit isolated from any distraction, and teachers deliver this information to them as succinctly and articulately as possible. From that perspective what had come to stand for the epitome of a learning event makes sense: a teacher lecturing a class in a school or in a corporate training center” (p. 9). Though in recent years this has model has changed significantly for many organizations.

Marshall (1997) argues that this traditional approach to teaching no longer works in the learning organization for a number of reasons. First it goes against the grain of the way employees perceive teaching in a learning organization. "The unexamined application of the Newtonian laws to complex adaptive social systems diminished our capacity for continuous
growth and change because it diminished our capacity to "grow" the individual and collective intelligence, energy, spirit, and hope of the whole system" (Marshal, 1997, p. 180).

Secondly, it assumes that teaching results in learning. This paradigm does not address the issues that gets to the heart of the learning organization. Senge (1994) states, "learning is a much more complex phenomenon than can ever be limited to a classroom. It is inextricably connected to how we live our lives, and to the excitement, challenge, motivation and support woven through our daily experience" (p. 45).

Learning in this type of organization does not flow exclusively from teacher to learner. “Learning communities are shaped by their members, but these communities reciprocally influence the identity, growth and learning of members “ (Marsick, et al., 2000, p. 21). The learning organization is considered a self-organizing system or learning community, so the teachers and learners will be one and the same. This will be a "Human systems involved in interactive patterns of relationships. In the open systems model, the learning of one person or group affects that of others; they are mutually interdependent” (Marsick, et al. p.11).

Finally, this open learning community is more involved in setting goals and objectives. Wheatley (1992) states that social units have a common purpose and set of rules for how they will act to achieve their goals. With this open system concept the organizational goals are accepted and embraced by the individuals within the organization. Management forced goals are not effective. As a result, the role of the trainer is more of a facilitator who nurtures learning experiences and coaches learners. They "help individuals and systems choose to reflect consciously and sometimes critically on feedback in light of
past experience and present of future direction” (Marsick et al., 2000, p.16). Senge (1994) believes that the trainers have a limited role to play in this process of learning since the learning that matters is inseparable from the work that the employee performs. He states, “Consequently the training and development professional is not nearly as knowledgeable as the supervisors or managers or perhaps other employees in understanding the nature and complexity of the work. They also lack the accountability and resulting drive to make the change. They do have an understanding and as such can help in that regards” (p.45). Senge argues “that generally managers are not overly concerned about employee understanding if it is not directly related to the work and cannot lead to action” (p.45). In other words the managers are primarily concerned with just in time and just enough training. He states “that in the learning organization it is much better to replace the schoolroom metaphor with a practice field or rehearsal hall” (p. 45).

Adult educators have to create safe environments where people individually and collectively can critically examine personal habits and choices. One on one coaching provides this kind of safe environment (Marsick et al., 2000, p. 16). Marsick et al. believe that the adult educator's role is changing to a new role of the learning coach, providing action-learning interventions based on observation. Learning coaches are skilled at group dynamics, understanding organizational dynamics, and they frame their work using systems thinking. They have keen powers of observation and are skilled at giving feedback and asking questions that stimulate further thinking. They help individuals and the group learn from the task at hand though discovery, experimentation and reflection on their experiences (p. 17).
This transformation will not be easy for many organizations. The biggest barrier to using this new learning in the system is a resistant organizational culture. For a learning organization to exist people will need to feel they can openly discuss different views, challenge others, communicate across perceived boundaries, take risks and share knowledge without being penalized in some way (Marsick et al., 2000, p. 17). Additionally, some people who develop and deliver training have a difficult time with this new system as well. "The system may not be structured in such a way that people who make decisions on its behalf notice and draw upon the learning of its members. People in power may not agree with these members or may not encourage communication that enables full, free and informed consideration of new ideas" (Marsick et al., p. 2).

In the American Society of Training and Development (ASTD) Handbook the history of training in organizations is summarized and from its beginnings through today it has evolved dramatically. According to Miller (1996) the training and development component within organizations, often viewed as a part of Human Resource Development (HRD), is taking on a new role. Miller states, “Many HRD professionals will be engaged in helping the organizations change and transform. Many of them will act as brokers for the constant learning that will make such changes. Learning professionals will work with many models of individual and organizational learning, especially those that describe how people learn in the context of work.”

However in the same ASTD Handbook is a chapter on Occupational Safety and Health Training. In it Gerard Scannell (1996) discusses the function of occupational safety training and information gathered by the Bureau of Labor Statistics that showed the high
percentage of injured employees receiving little or no training in the tasks being performed at the time of the injury. While Scannell goes on to state that this information should not necessarily be representative of American business, it would be a serious error to ignore the message it provides. In addition according to Scannell, of these injured employees a significant number reported the following: their employers provided training only following an injury-producing event, the instruction they did receive was perceived as being of little value in helping them to prevent the type of injury sustained, and the instruction provided by their employers was generally in lecture format with no written learning materials, lesson plans, instructional manuals, instructional aids, or provision for worker feedback. Most of the information the workers did receive came not from their employer, but from fellow workers, employee representatives, salespersons for personal protective equipment, and from literature that accompanied tools, machines and chemicals used in their work. While again, though not representative of American business, this information does indicate that there may be a flaw in a system that struggles to provide occupational safety training to workers in the workplace. To understand how this occupational safety training system evolved, it is important to understand where it resides within the greater role of occupational safety as a science.
Expanding the Perspective in Occupational Safety Training

Transmission Perspective

In a command and control, top down managed organization, senior management made the majority of the business decisions, which were then passed down to managers and supervisors (Conger, 1997, p.2). The concept of safety as an engineering function worked well in this type of organization. Occupational safety was something that could be designed, engineered and built into the system, and managed using the same principles.

Machines and parts were guarded, fire systems installed, and ventilation systems designed to move dangerous chemical vapors away from employees. As safety systems were engineered into the organization, workers could be trained on how to properly use these safeguards. This was "know how" information that could be taught to employees and transferred to the workplace, and with a method of enforcement the workplace could remain relatively safe. The “three E’s of safety”, engineering, education and enforcement, became the foundation of the safety profession (O'Reilly, 2001).

Many safety professionals are still required to fulfill multiple roles in the workplace including engineer, advisor, and compliance officer as well as safety trainer. Most safety professionals are educated through programs based in engineering or chemistry (Lischeid, Sulzer-Azaroff, & Alavosius, 1997) and often lack any formal background in adult education. The occupational safety content expert developing and delivering safety training conforms with Pratt's (1998) definition of the transmission perspective where the trainer, as content expert, transmits the information to the student. This method of safety training has
met the needs for many of the workplace issues regarding safety. In fact, based on the history of safety this method of delivering information to employees has been quite effective (U.S. Department of Labor, 1998). Safety professionals are like other content experts who also provide training in similar roles. According to Pratt (1998) they are often hired for their expertise, generally not for their counseling skills (p. 63). A report by Cohen and Colligan (1998) based on an extensive literature review of occupational safety training states that, “Training and education of workers has not traditionally been considered a prime responsibility of most OSH professionals. In fact, most graduates of OSH programs are ill prepared for this assignment. While they have the technical knowledge, many graduates lack skills in adult education, training, and program evaluation.” An outcome of their research found “the net result is very uneven training quality” (p. 193).

For the occupational safety professional, however, the transmission method has remained a valid choice. Employees need to know specific aspects of safety related to their jobs such as, how to use a machine guard properly, or know the hazards of the chemicals with which they work, or know the hazards of loud noise and how to properly insert earplugs. According to Pratt (1998) this was the purpose of transmission training, “providing content - explicit subject matter for hierarchal learning, built on prior knowledge and presented in a step-by-step manner. Math, grammar, plumbing and electronics are examples of well-structured content areas” (p. 66) and safety engineering is no different. With the safety professional’s engineering or science background and as content experts, the transmission perspective is not only an appropriate method, but also well within the comfort zone of many safety professionals. They can take this well structured knowledge and break it into
manageable pieces, then design a course in a way that delivers this information to the student. The instructor can address the students’ individual learning styles by transmitting the information through a variety of means. Pratt (1998) contends that typically transmission methods of delivery include lectures, videos, guided instruction, reading material and group discussions. These programs are usually objective based, and the objectives and goals are clearly defined by the instructor or teacher (p. 66).

According to Pratt (1998) the ultimate goal of transmission training is for the instructor to transmit the information to the learner and the learner in turn to incorporate or transfer this knowledge into their workplace, although most trainers and educators will agree that transfer doesn't always occur (Broad and Newstrom, 1992; Holton, Baldwin and Naquin, 2000). There are problems with basic transmission training that allows information to be lost, and this may be intensified with safety training, which in many organizations is often driven by compliance rather than the learner’s pursuit of knowledge. According to Pratt (p.74) transfer may be difficult because the content may not move from the teacher to the learner and then to the work setting. Pratt identifies a few reasons why transfer may not occur; it is often delivered in too big chunks or too much information; it often lacks proper support due to insufficient practice; if it is taught only once there may still be comprehension problems, and; learners may not really be participating as much as the teacher expected (Pratt, 1998, p.75).

Although performance outcomes are the intent of the OSHA standards requiring the training, like other disciplines that rely predominantly on transmission training, evaluating the effectiveness of safety training often becomes a measurement of information retention
through quizzes rather than actual performance outcomes. According to O’Driscoll (1999) simple evaluation of transmission methods can be relatively straightforward and as a result attractive from the safety trainer's viewpoint (p.84). This may again be exacerbated if the training is driven by compliance. Pratt (1998) contends that if the teacher or trainer has matched course structure and content with course objectives, which are often done, then learning and knowledge can be easily measured and validated with regard to the objectives (p. 75). On the other hand, if the evaluation shows that the students did not learn the content then the teaching can be readjusted and more training can be provided (Pratt, p.78).

Accordingly from the transmission perspective, learning is something that the teacher controls and can adjust by changing a few variables (Pratt, p. 75).

The simple transmission training perspective is still the typical training format for many safety professionals. According to Pratt (1998) those who utilize the transmission perspective may recognize that personal issues and differences affect learning, but they tend not to focus on this aspect. Unlike counselors or therapists who rely on a Developmental Perspective or Nurturing Perspective, "Transmission teachers do not have to become involved in areas beyond their competence" (p. 63). The only purpose of transmission teaching is to move the content or skills from the teacher or expert, to the learner (Pratt, p. 65). Yet in recent years OSHA has placed an increased emphasis on performance based standards and as a result there has been a shift in the role of the safety professional to focus on actual workplace performance. This shift has forced the safety professional to look beyond the boundaries of engineering and chemistry and to begin to explore and incorporate the psychosocial aspects of safety.
Recognizing the Need for an Expanded Perspective

Increasing involvement in areas beyond safety engineering has become important for the safety professional for a number of reasons. First, according to a report by the Institute of Medicine (2000), with the changing nature of the workforce and the workplace, an increasing number of work related psychosocial demands and stressors have become occupational safety issues. This trend has compelled the safety professional to be more attentive to these areas. In response to this one of the outcomes of the Institute of Medicine report was a recommendation that “NIOSH should broaden its graduate training support to include the behavioral health sciences (e.g. psychology, psychiatry, and social work) by developing and maintaining training programs in work organization and the prevention and treatment of physical and mental effects of work-related stress” (p. 14).

Secondly, areas beyond engineering must be explored because, according to Lischeid et al., (1997) it is generally believed that understanding why people act the way they do is necessary to get to a higher level of workplace safety. This has allowed the recognition of a gap between the safety professionals’ area of practice and their educational background. In a survey conducted by Lischeid, et al., one respondent stated, “Our safety engineering program is based in the Dept. of Industrial and Operations Engineering. Because we are engineering-based, our entire program emphasizes design of facilities, equipment, tooling and processes to promote safety. Our program places strong emphasis on ergonomics, and our underlying philosophy is based on designing the job to match the worker, not vice versa. Therefore, we don’t spend a lot of time on behavior management issues” (p. 36).
Another opportunity for the safety professional to move beyond the realm of engineering occurred when behavior based safety emerged as the springboard for what was a new perspective in dealing with safety issues. In recent years the popularity of behavior based safety programs has been demonstrated by the overwhelming number of seminars, programs and training courses based on this topic (Geller, 1996). Professional journals abound with articles and research papers exploring this topic. This organizational behavior management view surfaced in the late 1970s when academic psychologists began research on behavioral techniques for accident prevention (Hans, 1996). The attention this approach has gotten attests to the implication that the psychological aspects related to workplace safety have been clearly recognized. More recently, however, it is argued that behavioral psychology in itself falls short of addressing issues that are cognitive or sociological in nature (Kamp, 2001).

Finally, as safety professionals explore the science of workplace safety it is increasingly viewed as a human performance issue rather than merely an engineering issue. This is evident in an increased emphasis in performance based OSHA standards or OSHA’s 1989 Safety and Health Management Guidelines that emphasized both management commitment and employee involvement as key elements in addressing work related injuries and illnesses (U.S. Department of Labor, 1989). A performance perspective encourages other ways to address safety rather than strictly through engineering, safety training and enforcement alone. According to Combs and Salvatore (2000) the use of a human performance improvement model gives the discipline a greater perspective and broader arsenal of integrated interventions that includes training as just one tool. Human
performance improvement is defined as "the science of improving human performance in the workplace through analysis and the design, selection, and implementation of appropriate interventions." (Combs & Salvatore, p.3) By focusing on performance, interventions may be instructional or non-instructional and might include engineering as well as other controls that are commonly recognized by OSHA. This perspective provides the safety professional with an opportunity to focus on training transfer issues that might otherwise be ignored or assumed to be exclusively a management or human resources issue. In general, the exploration of psychosocial aspects of safety has required the safety professional to explore training perspectives that move outside the realm of the fundamental transmission perspective and into such areas that include a developmental or nurturing approach (Pratt, 1998).

The Apprenticeship Perspective

There is yet another perspective that may offer new insight into the human performance issues of safety practice. This view comes to light when the Apprenticeship Perspective of adult education is examined. Taken from this point of view, what for the safety professional might appear to be barriers to safety training may just be competitive, alternative, learning opportunities that are being provided simultaneously in the work environment which overshadow the classroom training. For surely people do learn in the safety training session, but as Pratt (1998) points out, "learning is incomplete if it is not textured and provided within the complexities and relationships that are very much a part of
the real situation" (p. 87). Perhaps the perceived performance gap that safety professionals attempt to bridge with classroom training is filled, albeit unintentionally, with other learning opportunities provided within the workplace.

While the transmission perspective is well known to those in education and most certainly to those in the safety profession, the apprenticeship perspective is most often found outside the traditional safety education system. Apprenticeship was used almost exclusively in pre-industrial workplaces by workers in trades, crafts and agriculture. Today apprenticeship is not the most common approach to training though it may be considered when teaching procedures, skills and crafts. Intellectual apprenticeship is used for disciplines and practices that are typically much more complex, like medicine and police work (Pratt, 1998, p. 83). Recently it has also re-emerged in structured on the job training and similar applications (Rothwell & Kazanas, 1994). While most trainers or safety professionals generally do not utilize the apprenticeship perspective, it may be worth exploring.

A Focus on Learning

To understand the apprenticeship perspective it is important to shift ones’ viewpoint from teaching, to learning. Wenger (1998) explains, "A key implication of our attempts to organize learning is that we must become reflective with regard to our own discourses of learning and to their effects on the ways we design for learning" (p. 9). This may be a significant shift from transmission teaching that implies the teacher has the authority over the content and technique of the learning (Pratt. 1998, p. 79). This shift from teaching to
learning has the potential to offer a significant contribution in understanding occupational
safety behaviors, because it forces the safety professional to stop asking how to teach better
in the workplace and instead forces them to ask how learners learn. Like Pratt says, "to
understand this (apprenticeship) perspective you must first identify how learning takes place
within this perspective" (p. 83).

Learning from the apprenticeship perspective occurs when, as Pratt (1998) states,
"we develop schemas about the way we understand the world. When we are faced with a
new situation or new piece of equipment we project our own schemas on the new situation,
framing it according to what we already know. When we begin, we have simplified schemas
that become more complex as we learn. These schemas become building blocks for our
understanding of the world. The simple schemas are expanded, revised and linked to form
more complex schemas of the world around us. Through more and more experiences the
process of revising, elaborating and integrating these schemas creates a complex web of
knowledge and beliefs that guides our thinking in a particular community of practice. Then it
follows that people with more experiences have more complex elaborate set of schemas (if
they have critically thought and processed) than those with less experiences. It is important
to understand with an apprenticeship perspective learning is both a product and a process.
The product is a change in our understanding or schema and the process is the testing,
building, revising and integrating of the schemas within a particular context of application”
(pp. 84-87). In other words, the schema that we take away from a setting is dependent upon
the context in which it is learned. The new schema or the learning is given meaning and
significance by the context in which it is learned. Or as Wenger (1998) states, "meaning
exists neither in us, nor in the world, but in the dynamic relation of living in the world” (p. 54). This means an adaptation to the view that reality is socially constructed. People make meaning of situations they encounter by filtering new impressions through prior frames of reference (schemas) that are influenced by society's collective understanding and norms (Marsick et al. 2000, p. 10).

**Situated Learning**

The process of learning from an apprenticeship perspective rests on a broader theory of constructivism. Situated learning is considered by some to be a type of social learning similar to apprenticeship, which "quite simply implies that people learn through observation and interaction with others in a social setting," (Merriam & Caffarella, 1991, p. 134). "This orientation has been explored from different perspectives though it originated with the behaviorists and then broke away to form a cognitive viewpoint" (Merriam & Caffarella, p. 135).

Jean Lave (1988) conducted a great deal of her initial work in the area of situated learning beginning from an anthropology perspective while exploring the concept of learning. Transfer of education or training became a key factor in Lave's work as she focused on the movement of knowledge from schooling to people’s everyday lives or workplaces. This led her to examine situations of everyday cognition (Lave, p. 23) with its relation to the use of mathematics. In *Cognition in Practice* (1988) Lave explains how math education for children started in the streets as a merchant’s tool and was introduced to children in the classroom to prepare them for work in the marketplace. The belief was that by providing
simple abstract mathematical concepts to children, they could transfer the information to the market place. From teaching children weights and measures it evolved into addition, subtraction and multiplication and continued to evolve into our modern mathematics taught today.

Lave used the well structured knowledge of mathematics in her early research and studied how people attempted to apply it in a real-life contextual setting such as a grocery store to determine the best purchase prices for various sized items, or for calculating measurements for use in a recipe. She discovered that people who could not normally perform the mathematical calculations in a classroom were able to use math to make multifaceted calculations while grocery shopping (Lave, 1988). She found in a significant number of instances, learning and the application of the resulting knowledge occurred almost naturally for people within the context in which that knowledge would be used. In other words, learning was contextual or situational. She explored this concept further and in her book written with Wenger refined the concept of situated learning. In Situated Learning, Lave and Wenger (1991) explored the concept of situated learning by looking at a number of occupational applications including; midwives, tailors, and butchers. They recognized the apprenticeship qualities of these professions and how new employees or apprentices would begin work from the edge or periphery of the work group or community and increase their involvement as they “learned”. This led to the concept of peripheral participation and communities of practice. Legitimate peripheral participation is used to describe “the engagement in social activity that has learning as the central element” (Lave & Wenger, p.35). As Hanks (1991) describes, “Situated learning implies a highly interactive and
productive role for the skills that are acquired through the learning process. In situated learning the individual learner is not gaining a discrete body of abstract knowledge that he or she will then transport and reapply later in contexts. Instead, he or she acquires the skill to perform by actually engaging in the process, under the attenuated conditions of legitimate peripheral participation” (p. 14). Lave and Wenger were not attempting so show that structured learning or critical thinking did not take place. Instead they were trying to describe a social learning that occurred through day-to-day activities. The social settings in which this legitimate peripheral participation occurs are defined as communities of practices.

Community of Practice

A community of practice is any social group whose members share a mutual engagement, negotiate a joint enterprise and have developed a shared repertoire (Wenger, 1998). A community of practice can be any social group whose members collectively have established these criteria, which can consist of almost any social group from a sports team, to a church group, to professional organization, to department within a company, to an Internet support group. Wenger (1997) describes how meaning or learning becomes embedded in our lives as he states, ”Communities of practice are an integral part of our daily lives. They are so informal and so pervasive that they rarely come into explicit focus, but for the same reasons, they are also quite familiar. While the term may be new, the experience is not. Most communities of practice do not have a name or issue membership cards. Yet, if we care to consider our own life from that perspective for a moment, we can all construct a fairly good picture of the communities of practice we belong to now, those we belonged to in the past,
and those we would like to belong to in the future. We also have a pretty good idea of who belongs to our communities of practice and why, even though membership is rarely made explicit on a roster or a checklist of qualifying criteria. Furthermore, we can probably distinguish between a few communities of practice of which we are core members, and a number of others in which we have a more peripheral kind of membership” (p. 38).

If a department within an organization is used as an example, it can be seen that the history of the department existed before some members enter and will continue to exist after some members leave. In other words, the shared history of the department or a shared sense of “what it is they do” does not necessarily reside solely in people, books or procedures, even though those items may exist. The real meaning for the department is negotiated by its participants even though certain influences from outside the department can greatly affect its meaning. The department negotiates with its participants its meaning and function. The participants are not necessarily defined by physical boundaries, although they may be. There might be some participants that reside in other buildings, or even other cities and states. Yet the participants of that department collectively determine the work that they do or their mutual enterprise. They will also share repertoire with regards to language, forms, stories, symbols, jargon, actions and concepts. Based on this concept of a department as a community of practice, it becomes evident that communities of practice reside all around and most of us participate in many (Lave and Wenger, 1991; Wenger, 1997; Wenger, 1998).

Participation in a community of practice varies depending on many factors including personal history in other communities, future aspirations, and where one is in regards to their life trajectory (Billett, 1998; Wenger, 1998). Billett (1998) describes this individual level of
practice as personal ontogeny, which means the development or course of development of an individual organism (Merriam-Webster, 2003). A new employee in a work setting may choose to become involved or participate differently than an employee who is anticipating retirement in two months, and yet they both reside within the same community of practice. A young, single, and ambitious employee hoping for rapid promotion within the company will likely seek a different level of participation than a middle aged, single parent with three children. Billett (1998) discusses how ongoing participation in overlapping communities of practice greatly affects personal ontogeny as well. Someone working part-time while attending school fulltime in anticipation of changing careers will participate differently than someone who is heavily focused on advancement in their current career within that community. In other communities of practice perhaps a church group or professional organization, one participant may choose to become a board member which would entail a more central level of participation, while others may choose only to attend the meetings once every few months, which may result in a more peripheral level of participation. Both levels of participation would be legitimate based on that person’s current life trajectory and ontogeny yet, both would reside within the same community of practice. People choose participation based on many factors, but they develop meaning when his or her internal world and past histories interact with other members of the community of practice, in the present.

People move into and out of various communities of practice throughout their lives for various reasons. They may, as Marsick et al. (2000) state, "move frequently and not always voluntarily in and out of systems when they no longer find themselves in tune with the social units’ purpose or social rules" (p.2). “Throughout life people move from one
social setting to another sometimes in conscious awareness but in other times a taken-for-granted method” (Merriam & Caffarella, 1991, p. 256).

Construction of Knowledge

Billett (1998) explains situated learning as a developmental process that “draws together cognitive and socio-cultural constructivist theories to propose that the transformation and development of adults’ knowledge is secured through participation in social practice throughout their life history” (p. 21). He goes on to discuss five premises that support this view. First, the reinforcement and construction of individuals’ knowledge is established within the moment-to-moment problem solving activities that are part of daily living. “This problem solving is part of both routine and non-routine goal-directed activities in which people are constantly engaged”. Secondly, he believes that the knowledge that individuals construct is not just conceptual and procedural in nature, but dispositional as well. This dispositional aspect includes values, affects and attitudes, that in turn address such things as preference, morality and aesthetics. Third, the nature and circumstances in which we encounter the problem solving influence how and what knowledge we chose to acquire. Fourth, “different social practice provides for the construction of knowledge in different ways through the privileging of, and access to, different forms of knowledge. That is, the social practice that individuals engage in determines access to activities and the quality of guidance and support that they will experience. Factors associated with ethnicity, race, age and gender that are inherent at all levels of social practice influence individuals’ access to activities and guidance with resultant developmental outcomes” (p. 21). Finally he believes
that ongoing participation in different and overlapping communities of practice have a huge
effect on the level of learning, as well as personal development.

Living becomes the matter of making meaning of the present through mutual
engagement with others. *Learning* then is the making of that meaning. Essentially learning is
an activity that takes place constantly through social interactions. It occurs whether teachers
want it to or not. Teachers do not direct it or really for that matter control it by teaching. And
according to Lave (1988), it happens despite the teacher.

What is critical to understand is what Lave and Wenger (1991) emphasized very
clearly that situated learning "is not itself an educational form, much less a pedagogical
strategy or a teaching technique. It is an analytical viewpoint on learning, a way of
understanding learning" (p. 40). They go on to emphasize that, “learning through legitimate
peripheral participation takes place, no matter which educational form provides a context for
learning, or whether there is any intentional educational form at all. Indeed, this viewpoint
makes a fundamental distinction between learning and intentional instruction. Such
decoupling does not deny that learning takes place where there is teaching, but does not take
intentional instruction to be in itself the source or cause of learning, and thus does not blunt
the claim that what gets learned is problematic with respect to what is taught” (p. 40-41).
This focus on learning rather than teaching is important because it puts the learner at the
center of the learning experience not the teacher (Pratt, 1998) and this may be difficult for
those whose role is traditionally that of a safety trainer. Teaching has played such a central
role in the process that the concept of “everyday learning” had historically been ignored. In
fact Lave (1988) labors this point in her early work. She stresses that educators have
historically shunned the concept of real life, every day learning because it was not scientific and could not be analyzed through experimentation.

According to Lave (1988) everyday learning, to a great degree, has been disregarded as a form of “common sense”, yet it is precisely this common sense that is the central point of situated learning. As Wenger points out, “Common sense is only commonsensical because it is sense held in common. Communities of practice are the prime context in which we can work out common sense through mutual engagement. Therefore the concept of practice highlights the social and negotiated character of both the explicit and the tacit in our lives” (1997, p. 39). Furthermore it is this tacit knowledge that is so paramount in the concept of situated learning and social practice. Learning through participation within these practices “includes both the explicit and the tacit. It includes what is said and what is left unsaid; what is represented and what is assumed. It includes the language, the tools, the documents, the images, the symbols, the well-defined roles, the specified criteria, the codified procedures, the regulations, and the contracts that various practices make explicit for a variety of purposes. But it also includes all the implicit relations, the tacit conventions, the subtle cues, the untold rules of thumb, the recognizable intuitions, the specific perceptions, the well-tuned sensitivities, the embodied understandings, the underlying assumptions, the shared worldviews, which may never be articulated, though they are unmistakable signs of membership in communities of practice and are crucial to the success of their enterprises.”

According to Broudy (as cited in Tennant and Pogson, 1995, p. 78), “As human beings, we know more than we can tell.”
Although Lave and Wenger are not “proposing ways of “implementing” or “operationalizing” (situated learning) for educational purposes” they do “hope that it will inform educational endeavors by shedding a new light on learning processes, and by drawing attention to key aspects of learning experience that may be overlooked” (p. 41). This real life, everyday learning warrants further exploration especially for safety professionals. When the workplace community of practice is examined, and safety professionals weigh the learning that results from traditional safety training against situated learning that occurs in ongoing participation, new opportunities for assisting or promoting learning may be presented.

It is suggested that perhaps employees are not only learning from the safety training that is taught in the classroom, but in addition they gain a good portion of their safety knowledge through legitimate participation in the workplace community of practice. "Even miseducative experiences may be regarded as learning experiences…all learning begins with experience" (Merriam & Caffarella, 1991, p. 256). Is it likely that the people, whose roles employees admire and model their behaviors after, are teaching which safety concepts are appropriate and which are not? For example, employees can be taught in a classroom that wearing safety glasses while working in a certain area is important and required, yet if once the employee moves to that area, they "learn" through peripheral participation within the community of practice that wearing safety glasses are unimportant, then that which was taught in the classroom is irrelevant despite the knowledge they have obtained. After they complete their classes and start working "on the floor", then integration into the community
of practice really begins (Wenger, 1998, p. 99). Despite how much information and knowledge safety trainers provide such as statistics on eye injuries, demonstration of various types of safety glasses, what employees learn when they get "on the floor" may be that they do not need to wear them. Of course certain employees may decide to wear safety glasses because of what they learn in the classroom or despite what they learn to the contrary within that community of practice. Perhaps this became part of their personal ontogeny through experience gained from another community of practice, perhaps another workplace, or personal experience by a member of their household, or through formal safety training.

It is important to emphasize that the goal of this study is not to discount the importance of safety training. Lave and Wenger stress that teaching and training are still quite necessary. The goal is to explore ways in which learning takes place and to find ways to optimize the potential of that learning. Perhaps there are instances where situated learning and apprenticeship can occur instead of, or in conjunction with, formal safety training. This may be particularly useful where the objective of the training is specific employee workplace performance.

The reality of situated learning becomes obvious when Hanks (1991) raises an issue that seems so appropriate for those safety professionals who view the transmission of information alone as a method to address performance. He states that Lave and Wenger “rightly question the idea that verbal explanation is a uniquely effective mode of instruction, somehow superior to direct demonstration.” Given the concept of situated learning, “the inverse claim would appear more natural. Quite simply, if learning is about increased access to performance, then the way to maximize learning is to perform, not talk about it” (p. 22).
Situated Learning in the Workplace

While the theoretical framework of situated learning has been established, very little research has been done to date exploring how it plays into workplace learning. Many of the studies in the area of situated learning or situated cognition are based on research in primary and secondary (K-12) education. Although the K-12 literature was reviewed for relevancy, the K-12 population was not the focus of this researcher’s study.

A study by Hendricks (2001) compared two groups of seventh graders on the ability to learn the concept of causal reasoning. One group was taught the topic of causality using a situated learning model and another group was taught using what was portrayed as a traditional abstract model. In the study, the term situated learning was used to describe reading a story about causality then allowing the students an opportunity to discuss the concepts. The study did indicate a significant difference in the two groups immediately following the instruction yet found no significant difference in the two groups regarding final training transfer.

Another study of fourth grade students by Griffith and Griffith (1996) compared the learning of students who were provided information on reading a map to a group who were given exercises that allowed them to practice reading maps in the library after being given map-reading instructions. The study showed no significant difference in learning between the groups.

For purpose of this research neither of these studies is highly relevant because of the population (K-12) used and both scenarios would be considered simulations by definition of this research. Situated learning will not in itself be merely an opportunity to practice skills
that are taught through traditional means. Many of the present safety training programs being offered provide an opportunity for hands-on exercise.

Another study by Ethell and McMeniman (2000) allowed student teachers an opportunity to learn from more experienced teachers. The study made use of videotapes of classrooms in which a (master) teacher was schooling children. As the video was watched by student teachers, the master teacher that was in the video was also observing the video. He or she explained the thought process they used in making certain decisions that were witnessed on the tape. In this qualitative study the students believed this process was much more beneficial than just being present in the classroom watching the master teacher. This gave them an opportunity to understand the underlying thought process and appreciate the complexity involved in the teacher’s decision.

The Mine Safety division of NIOSH has begun to research a similar videotaped apprenticeship approach to hard rock mining safety. In the researcher’s discussion with the producer of the video "Zen and the Art of Hard Rock Mining" (National Institute for Occupational Safety and Health [NIOSH], 2001), the producer explained that this method is being explored because by nature of their personalities, “miners are not going to sit in a classroom and listen to a lecture on mining safety.” As a result the use of an apprenticeship model was being explored as an alternative to traditional transmission teacher-centered training. Videos are made that use a master miner to demonstrate techniques to an apprentice. These videos are then used as training for other miners. As of the date of this study, research has just begun on the effectiveness of the method.
To make the video, the producer selected a highly respected miner to provide the
teaching in the video. As the video was viewed, certain concepts were observed. The
master miner was a person who was admired by co-workers and viewed as a role model for
other miners. Much of the video was made in the mine with the apprentice and master miner
working together. The information that was being provided to the apprentice was appropriate
at the time. In other words it was "just enough information" for the particular task and it was
"just in time" for that particular task. This was very different from the "too much" and "just
in case" training typically provided in a classroom. It was also interesting to see that there
was a contextual content that may not exist for many safety professionals who conduct
training yet may have never actually performed the work to which the safety practices are to be connected. For example, when watching the video it was noticed that the master miner
was not wearing safety glasses during an operation that caused a great deal of dust and small
rocks to fall on him. As a safety professional, this researcher’s first impression was that he
should have been wearing them. Later in the video when the apprentice questioned the
master about this, he responded by stating that he probably should have been wearing the
safety glasses, but in that situation, the mines sometimes reach temperatures close to 100
degrees Fahrenheit with almost 100% humidity. Through his experience, safety glasses
almost immediately fog and cake with sweat and dust creating a greater hazard. Instead, he
has learned to wet the work area thoroughly with water to minimize dust, squint his eyes and
turn his head downward when performing that particular procedure and has thus avoided any
eye injuries in doing so. This information within the context of the work setting was much
more realistic and valid than what might have been transmitted in a classroom setting. It was
contextual information that many safety professionals may not have known, having never performed that work. While this researcher does not advocate a disregard for legality of the OSHA standards, merely telling employees to wear safety glasses is not a solution either. Perhaps instead as Senge (1994) stated a recognition that safety trainers have a limited role to play in this process of learning since the learning that really matters is inseparable from the work that the employee performs. The safety professional or trainer is not nearly as knowledgeable as the supervisors or perhaps other employees in understanding the nature and complexity of the work. But because they do have an understanding of safety they can help by working with the employee to develop solutions. Similar situations arise throughout the workplace where safety trainers have the book knowledge, but lack the hands-on practical knowledge that is so much a part of reality (NIOSH, 2001).

A study by Black and Schell (1995) examined adult learners in a graduate-level organizational behavior class who used their skills to simulate the design of an educational organization. While the researcher in this qualitative study found varying degrees of success in the simulation the fact that it was again a simulation made it of limited use for purposes of this study.

While simulation is certainly a useful teaching strategy, it is believed that there are too many subtle contextual components to a real setting that are missing during simulation. It is these subtle components, the tacit information, “the subtle cues, the untold rules of thumb, the recognizable intuitions, the specific perceptions, the well-tuned sensitivities, the embodied understandings, the underlying assumptions” (Wenger, 1997) that create the reality of the setting. These cannot be captured in a simulation regardless of how “real” the
simulation may seem. The knowledge that it is a simulation reduces its value significantly. While the operator in a flight simulator may not be able to perceive a difference from a real airliner, the knowledge that a mistake in either would have profound differences is still a part of the learning.

Henning (1998) completed a seven-month ethnographic study on refrigeration service technicians and situated learning within their jobs. He found that they used a “complex mix of data streams and interpretive processes” as they engaged in troubleshooting activities (p. 34). For example, the physical way of learning was the process in which the service people used physical objects within the realm of their work to interpret the condition of the equipment. These included impressions they received through sight, sound, touch and smell of the equipment. Often when they first arrived on a service call they performed a walk-through where they could rapidly check where the trouble may be using their senses. Examples of understanding came from possibly “hearing” a problem condenser or “feeling” the air flow across a blower. These were items that when asked how they learned to do this, the service men responded that the older guys taught them that. Another method is described as discourse genres where speech is used to indicate an opportunity for learning. The phrase “what do you think” was used followed by silence as a way competing theories on problems – such as variable speed compressors – was discussed between two service people. At the end of the discussion collective learning had occurred. Finally, he found a social relationship was established between the service people that allowed them to be comfortable asking each other for assistance. This was described as a family type relationship where bidirectional instruction was provided without fear of being reprimanded. This environment allowed
opportunities for learning. The significance to this study demonstrates how the tacit learning takes place within the community of practice that would go otherwise unnoticed. It was what Wenger (1997) described as “the tacit conventions, the subtle cues, the untold rules of thumb, the recognizable intuitions, the specific perceptions, the well-tuned sensitivities, the embodied understandings, the underlying assumptions, the shared worldviews, which may never be articulated, though they are unmistakable signs of membership in communities of practice and are crucial to the success of their enterprises” (p.38). The researcher in this instance was also an instructor in refrigeration who was exploring how learning occurs outside the confines of the classroom.

Stephen Billett (2001) has conducted research in situated cognition in vocational education. His study at a mining and processing plant examined the learning experiences of novice employees working alongside expert employees. Though Billett (2001) recognizes that the self-reporting nature of the study had limitations, he found that embedded learning opportunities were overall perceived as more beneficial than activities that were described through a disembedded instructional process. He found when the learning is removed from the appropriate context and based on description instead the whole nature of the interaction changes and understanding becomes more complex. He also found that when the learning is removed from the actual activities and social relation it was perceived to be considerably less effective. Overall he found that for situated learning to be effective it must be embedded in the authentic activities and social relations that comprise the culture. Billett emphasizes that instruction outside the setting may be helpful in supporting the learning, but this type of instruction alone is less effective.
These two studies are supportive in that they used adult learning situations and explored the effectiveness of learning within an authentic contextual based situation, not a simulation.

Only one article was found that discussed the subject of contextual learning and occupational safety. The article was descriptive of the effects that unintentional learning has on workplace safety. R. Bruce Dodge (1998) discusses how learning can often be unintentional and unplanned. He maintains that unsafe acts are learned through the culture and in everyday activities of co-workers. The writer’s recognition that contextual or situated learning is occurring to support unsafe acts is discerning.

Beyond the above-mentioned article, no other research was found that explored how situated learning plays into the effects of occupational safety. Cohen and Colligan (1998) conducted a comprehensive literature review on Occupational Safety and Health Training. Their report covers eighty articles that met criteria for inclusion. While they found great variation in results of the training, there was little mention of the variations in delivery of the training. They did find that the training that was most effective was training that targeted site-specific problems or when it was influenced by “extra-training” considerations such as management’s support for transfer, feedback and incentives. No mention of contextual based learning was provided in the literature review.

In a report requested by NIOSH conducted by the Institute of Medicine (2000), the following recommendation was expressed. “Expected changes in the workforce and in the nature and organization of work in the coming years will result in workplaces that will be quite different from the large fixed-site manufacturing plants in which OSH professionals
have previously made their greatest contributions. The delivery of OSH services will become more complicated, and additional types of OSH personnel and different types of training than have been relied upon to date will be needed. Simply increasing the numbers or modifying the training of occupational safety professionals will not be sufficient since the primary difficulty will be to provide training to underserved workers and underserved workplaces. Traditional OSH programs must be supplemented by a new model that focuses on these workers and work sites” (p. 12). Exploring new ways to facilitate learning could provide support for new models of training.

Lave and Wenger (1991) state, “Undoubtedly, the analytical perspective of legitimate peripheral participation could – we hope that it will – inform educational endeavors by shedding a new light on learning processes, and by drawing attention to key aspects of learning experience that may be overlooked” (p. 41). But this is very different from attributing a prescriptive value to the concept of legitimate peripheral participation and from proposing ways of “implementing” or “operationalizing” it for educational purposes” (p. 41).

Selection of Research Design

In a field where science and engineering have been the dominant disciplines, a qualitative research approach to safety training may be somewhat unconventional. This is true even with an increased emphasis toward the psychosocial aspects of occupational safety where the emphasis is on a behaviorist approach that takes a solid quantitative perspective. In the book, *The Psychology of Safety*, S. Geller (1996), one of the leaders in the area of
behavioral based safety, discusses the importance of scientific knowledge and quantitative research, and is opposed to the perspective of “a person’s everyday selective experiences and interpretation of those experiences” (p. 9). He goes on to explain that these everyday experiences are “gained through biased subjective experience, whereas scientific knowledge is gained through theory-driven objective experimentation” (p.9). This behaviorist’s viewpoint stresses the importance of scientific design and methodology that has been prevalent in the field of occupational safety as well as other “scientific” disciplines. While undoubtedly this perspective has been extremely important in developing interventions that have demonstrated improved safety of employees in the workplace and certainly needs to be continued, a qualitative approach may be useful in understanding this field from a different perspective. While the thrust in research as well as training has been on observable measurable behavioral objectives, the common everyday communications, interactions, and perceptions of workplace safety that employees possess should not be ignored.

The importance of exploring knowledge from a qualitative perspective rather than from “theory-driven objective experimentation” should not be overlooked. In viewing these experiences from a qualitative viewpoint Moustakas (1994) describes the concept of life-world reality or “the realm of original self-experience that we encounter in an everyday sense. Investigation of the lifework – the way a person lives, creates, and relates in the world, precedes phenomenological reduction. While science operates with abstraction, the life-world is the concrete fullness from which this abstraction is derived… Science interprets and explains what is given; the life-world is the locus of all giveness. The experience of the life-world is perceptual experience. Unfortunately, following the position inaugurated by Galileo,
the world of ordinary, everyday experience was discarded for an “objectivity” of science that passes as reality. Yet every natural science presupposes the existence of a real world and thus departs from its own commitment to objectivity” (p. 48).

From the qualitative phenomenological perspective Husserl (as cited in Moustakas, 1994) pointed to a new way of looking at things, a return to things as they actually appear. The new way contrasted sharply with the natural attitude regarding perception, judgment, experience, and thought. It specified that only knowledge that emerged from internal perceptions and internally justified judging satisfied the demands of truth. In commenting on theses characteristics of human science, Harmon (as cited in Moustakas, 1994) emphasized that “science would include more participative kinds of methodologies; it would assume that, whereas we learn certain kinds of things from distancing ourselves from the subject studied, we get another kind of knowledge from intuitively ‘becoming one with’ the subject. We do not learn about reality from controlled experiments but rather by identifying with the observed” (p. 46).

This study will explore the safety knowledge that employees gather, during daily activities. This knowledge is the “everyday learning” that is the basis of understanding situated learning. It is the knowledge that is acquired in ordinary business and living; belongs to the individual; accepts the obvious; is vague; and is gained through uncontrolled experience that is sought through this research. It is the explicit and the tacit that is so important in understanding the chosen practices of the individuals. According to Wenger (1997) situated learning, “includes all the implicit relations, the tacit conventions, the subtle cues, the untold rules of thumb, the recognizable intuitions, the specific perceptions, the well-
tuned sensitivities, the embodied understandings, the underlying assumptions, the shared worldviews, which may never be articulated, though they are unmistakable signs of membership in communities of practice and are crucial to the success of their enterprises” (p. 39). He goes on to explain the importance of this form of “common sense” in understanding practice within the community. “Of course, the tacit is what we take for granted and it tends to fade into the background. If it is not forgotten, it tends to be relegated to the individual subconscious, to what we all know instinctively, to what comes naturally. But the tacit is no more individual and natural than what we make explicit to each other. Common sense is only commonsensical because it is sense held in common. Communities of practice are the prime context in which we can work out common sense through mutual engagement. Therefore the concept of practice highlights the social and negotiated character of both the explicit and the tacit in our lives” (Wenger, 1997, p. 39).

While the psychosocial behaviorist advises safety professionals to approach the field with a scientific perspective, it is an alternative perspective that the qualitative method seeks to explore. Creswell (cited in Valle and King, 1978) states that existential phenomenology ideally takes “the human being as he exists, a living, acting, feeling, thinking phenomenon, at this moment in an organic relationship to us” (p. vii). In other words, it seeks to “understand mankind not just in concrete living moments, but also man’s reaction to those moments” (Creswell, 1998, p. 276).

As Wenger (1997) states, “what is shared by a community of practice - what makes it a community - is its practice. The concept of practice connotes doing, but not just doing in and of itself. It is doing in a historical and social context that gives structure and meaning to
what we do. When I talk about practice, I am talking about social practice” (p 39). It is the holistic approach of everyday situations that make situated learning critical. It is the study of human activity, specifically learning, in its place of origin or in situ that makes it so relevant. It is everyday learning within the context of the community of practice. To remove it from this context would remove the aspect that makes it situated learning (Lave & Wenger, 1991). From this perspective this researcher believes a qualitative approach is the ideal method for exploring learning safety within the context of life.
CHAPTER THREE

Methodology

Introduction

The purpose of this study was to understand how learning occupational safety practices occurred for employees outside of and in addition to, what was taught through planned, intentional safety training. Specifically, this study explored the safety knowledge, skills and attitudes that the employees had learned, believed, and selected to incorporate into their daily lives and the source for that learning aside from the traditional training room. To accomplish this, the researcher chose to explore the phenomenon of learning safety from everyday activities and situated learning opportunities by obtaining from the employees verbal descriptions of their perceptions of learning aside from intentional safety training. The essential nature of these learning opportunities were extracted from these descriptions by phenomenological analysis.

Conceptual Framework

The basis for this study was founded on the belief that social, situated learning occurs within the workplace community of practice and this learning occurs regardless of, and in addition to, the learning that occurs through intentional formal training activities. Situated learning is the process in which people develop personal schemas and make meaning within, and in accordance to the daily activities in which they participate. Situated learning theory
implies that people learn through the actions they encounter in everyday situations, and by contextual social interaction with others within communities of practice such as the workplace. Meaning or learning is mutually derived with other members or participants in the community of practice (Billett, 2001; Lave, 1988; Lave and Wenger, 1991; Wenger, 1998). Essentially this is learning that occurs by “rubbing elbows” with other members of the community of practice. It is critical to understand that learning in this regard is separate from teaching. In a traditional transmission workplace safety training model, employees are removed from the context of the workplace and provided with safety information, knowledge and skills in a classroom or similar setting. The knowledge, attitudes and skills are then ideally transferred back to the workplace to be applied. Applying transfer strategies can increase the transfer of the intentional safety training to the workplace. If the situated learning concepts of Lave and Wenger (1991) hold true in regards to workplace safety, then the unintentional or unplanned day-to-day learning experiences that occur within the context of the workplace (situated) may support and strengthen, or perhaps run counter and weaken that which was learned through formal safety training in the classroom. Lave and Wenger state that employees start at the periphery of understanding within the community of practice and move to a greater level of understanding and learning in the workplace as they model and develop knowledge and skills from the “masters” or mentors within that community (see Figure 1). In this figure employees are removed from the work environment (blue oval) and provided training in an intentional, structured, training setting (red square). Employees are then returned to the workplace with the required knowledge, skills and attitudes to be transferred to the work setting. By using a situated or contextual learning model the masters
in the workplace are also teachers providing significant information, knowledge and skills to the other, less experienced co-workers. This situated learning could realistically support or run counter to those safe work practices that are taught in the classroom,

To this end, this study is founded on the precept that an individual’s personal concept of occupational safety might, to a great degree be the result of situated learning within the workplace community of practice. Based on this conceptual framework, this study will explore what it means, in the participants perspective to perform a job safely and how were these important safe practices learned, and in their practice how employees encounter affordances of situated learning as it relates to performing their jobs well and performing them safely, and how these affordances, encounters, and situations play a role in learning safe work practices that are incorporated into the lives of the participants.
In the traditional transmission training model, employees are removed from the context of the workplace and provided with information, knowledge and skills in a classroom or similar setting. This information is then ideally transferred back to the workplace. Transfer strategies are used to strengthen or increase the transfer process. Learning that occurs within the context of the workplace (situated) may either run counter to or support that which was learned in the classroom.
Pilot Study

The researcher conducted a pilot program in 2002 as a requirement for a Qualitative Research course. At this time interview questions were developed to see if they could elicit meaningful data and if in fact, people had stories to share regarding learning safety outside the training classroom. Three people were selected for interviews, which were conducted meeting all the requirements of the University and course. This pilot demonstrated that people did in fact have multiple and powerful experiences and sources of learning that occurred outside the classroom. These learning experiences occurred at different times during these people’s lives and involved a variety of other communities of practice such as families, military, organizations, and other work environments. Participants also described a variety of “masters” that were part of these situated learning experience including mentors, co-workers and parents. The outcome from this pilot allowed the researcher an opportunity to make the decision, in conjunction with the course professor, to explore a phenomenological approach to the present research. The pilot also allowed the researcher, again with the assistance of the professor, to edit and rephrase the interview questions. Most importantly, however, the pilot demonstrated that the data gathered could potentially provide a meaningful source of information regarding safety learning that occurs outside the classroom.

Research Design

To explore the perceived meaning of the reality and experience of day-to-day learning from the individual this phenomenological study employed in depth interviews of employees
from a biotechnology corporation in the Research Triangle Park. As Creswell (1998) states, “a phenomenological study describes the meaning of the lived experiences for several individuals about a concept or the phenomenon. Phenomenologists explore the structures of consciousness in human experience” (p. 51). In a phenomenological study, the researcher seeks the essential structure or underlying meaning of an experience and describes the intentionality of consciousness or “where experience contain both the outward appearance and inward consciousness based on memory, image, and meaning” (p.52).

Stewart and Mickunas (in Creswell, 1998) discern four themes that must be embraced by the phenomenologist. First, there is what they describe as a return to philosophy, or the search for wisdom before it became “enamored with empirical science” (p. 52). Secondly, the concept of epoche, or suspending all judgments about what is assumed to be real until a more certain basis is discovered. Thirdly, the intentionality of consciousness or the realization that reality is related to one’s consciousness of it. Finally, the refusal of subject-object dichotomy, or the accepting that “reality of an object is only perceived within the meaning of the experience of the individual” (p. 53).

Population

The site selected for this study was a biotechnology manufacturing and research company located approximately six miles from RDU Airport in Research Triangle Park (RTP), NC. The campus with 450 employees consists of a manufacturing building and a research/administrative building. The RTP site manufactures a number of pharmaceutical products. The products are manufactured using a biotechnology process that extracts the end
product from genetically engineered Chinese hamster ovary (CHO) cells. During this process the CHO cells are nourished in small vessels and reproduced, then transferred to increasing larger vessels. Finally, the end product is removed for packaging. In addition to the manufacturing departments, there are numerous laboratories that support production. The researcher has provided some safety consulting and training at this facility since the mid 1990’s.

This site was selected for a number of reasons. First, it offers a setting where the known structured, intentional, safety training has been provided in a consistent manner. This consistency exists since the organization and operations are required to meet FDA mandates. As a result, the training that employees receive must be consistent and specifically documented. This consistency is maintained by offer training that is objective based and provided in classroom settings. All training must also be accompanied by a quiz or summary exercise as well as a perception survey. Recently, computer based safety training has begun to be utilized to fulfill many of the training requirements. Again this ensures that all employees are being provided training with consistent format and content. In addition, all of the employees within a certain department or performing specific tasks are expected to receive similar safety training. A training matrix for each employee is maintained, and making sure that the matrix is complete is critical to the employee’s performance plan. This consistency ensures that all participants have had the same baseline classroom safety training.

This site was also selected because the company and management alike have established a high level of commitment to safety for its employees from the onset. The
Safety Manager as well as upper management has placed a high regard on safety. Accidents are thoroughly investigated and safety committee meetings are conducted regularly. Yet despite the efforts of management and the emphasis placed on safety, including training, accidents continue to occur. The root cause analysis of these accidents often indicates a gap in employee knowledge although this information is provided during structured safety training. This implies that for whatever reason, the safety emphasis and training are not 100 percent effective. Despite the best efforts of management, safety training transfer is not totally occurring.

Sampling Strategy

The purpose of the phenomenological study is to find participants who have experienced the phenomena, in this instance learning safety outside the classroom and are willing to describe that experience. The end result provided a detailed description of the experience of how the participants learned safety outside the classroom. According to Lave and Wenger (1991) all members of a community of practice are involved in a learning process. These learners or apprentices gradually, “assemble a general idea of what constitutes the practice of the community. This sketch of the enterprise might include who is involved; what they do; what everyday life is like; how masters talk, walk, work, and generally conduct their lives; how people who are not part of the community of practice interact with it; what other learners are doing; and what learners need to learn to become full practitioners. It includes an increasing understanding of how, when, and about what old-timers collaborate, collude, and collide, and what they enjoy, dislike, respect, and admire. In particular, it offers
exemplars including masters, finished products, and more advanced apprentices in the process of becoming full practitioners” (p. 95). In essence, learning is participation within the community of practice (p. 49). Based on this definition, any participant within the workplace community of practice was a learner and consequently could be considered a likely research participant.

Moustakas (1994) states that regarding phenomenological design there is really “no in-advanced criteria for locating and selecting the research participants” (p. 107). General considerations for specific criteria could be given, but essentially, the research participants must have experienced the phenomenon, are interested in the research and are willing to participate in the lengthy interview (p. 107).

Unfortunately, there is virtually no previous research available to exemplify the characteristics that best represent a tendency to be more or less receptive to situated learning. Consequently selecting participants was based on their availability within the selected population and their willingness to participate. Other than the characteristics of the selected population, every effort was made to reduce any bias in the selection of participants and every effort was made to identify any potential biases that may have occurred.

All employees have had essentially the same classroom training within the organization, therefore it is highly probable that the variations in the degree to which workplace safety is practiced is more a function of outside variables including the participants personal ontogeny, situated learning and supervisory support rather than formal training. The variation in department selection provided a broad basis of information for the initial interviews in this regard. The participants were selected from a number of different
departments within the organization. Departments were targeted from those offering a variety of job functions including: manufacturing, maintenance and laboratories. Since occupational safety learning was the focus of the study, the researcher believed that a greater abundance of information could be obtained from volunteers within departments where the practice of workplace or work related safety played a more prominent role in the workday. These were departments that generally included jobs where there was greater risk regarding safety concerns. For this reason departments such as laboratories, maintenance and manufacturing were targeted.

The Safety manager assisted in identifying the managers of these targeted departments to solicit volunteers. Other than targeting specific departments for volunteers, no exclusion criteria were used during this process and any volunteer was utilized regardless of type of work experience, leadership and accident history. The Safety manager contacted two lab managers, two maintenance managers and four manufacturing managers regarding the research and the need for volunteers. The safety manager forwarded an email to the managers from the researcher that outlined the research. The email briefly explained the purpose of the research, confidentiality of the information and the time impact on the volunteers. The managers relayed the information to employees either through email or an announcement at a department meeting. Volunteers were asked to contact the researcher directly if they were interested in participating in the research to eliminate supervisors knowing who participated. The final selection process was dependent upon the availability of subjects during workdays. The work performed at this site was process dependent and as
such the process production determined the work requirements of the employees and availability at the time of the interviews.

Subject Ascertainment

Permission was obtained from upper management to conduct the interviews and research (Appendix A) before the safety manager was contacted. Once the employees were asked verbally or by email if they in fact cared to participate in the research they were informed to contact the researcher directly. Despite being told this, some of the volunteers replied to the safety manager or training manager regarding their interest in participating. In these cases the email that the safety or training manager received was forwarded to the researcher. Once the volunteers contacted the researcher a brief description of the purpose of the research, confidentiality statement, how the interviews would be conducted and informed consent form was sent to the volunteer. They were also informed that they could choose not to participate then or at any time during the research. They were told that if they were still interested in participating to reply to the email. If they agreed to participate, they were contacted, either by phone or email, and a time was arranged for the interview.

Informed Consent

The participants volunteered and contacted the researcher. The names of volunteers were kept confidential by the researcher and were not divulged to the company. The participants were informed of the confidentiality of the interview to encourage them to speak freely and openly about their learning experiences. After the initial verbal agreement to participate was made, a letter was provided to the participant/employee (Appendix B) that
provided them with a written explanation of the research. They were also provided with a letter of agreement (Appendix C) that they were asked to sign and return to the researcher. The participants were given a copy of the letter and agreement to keep. After the interviews were transcribed all interview data collected as well as transcribed audio tapes were secured in a locked file cabinet. Audiotapes and transcriptions will be kept secured for five years from the date of the completion of this research.

Data Collection and Instrumentation

Interviews were conducted on-site and arranged during a time that was convenient for the participants and work schedules. Interviews were scheduled for a two and one half-hour time allotment with the understanding that if the interview was proving to be very rich with data, a second interview time could be arranged to minimize the participants’ time away from work. The interviews lasted from 1 hr 30 min. to 2 hr 30 min., with the mean time approximately 2 hr. The interviews were conducted in a private office behind a closed door and privacy was maintained throughout the interview. Participants were encouraged to get comfortable before the interviews began. At the beginning of the interview, participants were once again briefed regarding the purpose of the research and the confidentiality of the data. Permission to audiotape the interview was again asked and the participants were again told that the audiotapes were to be used only for transcription to allow the researcher to focus on the interview rather than note taking.

The researcher was interested in collecting personally held information at the level of the participants’ practical consciousness. For this reason semi-structured, open-ended questions were developed that were used as a guide during the interviews (Appendix D).
These questions were used to ensure that the entire scope of the phenomenon of learning safety outside the classroom was addressed. Moustakas (1994), however, reminds us, “The phenomenological interview involves an informal, interactive process and utilizes open-ended comments and questions. Although the primary researchers may in advance develop a series of questions aimed at evoking a comprehensive account of the person’s experiences of the phenomenon, these are varied, altered, or not used at all when the participant shares the full story of his or her experience of the bracketed question” (p. 114).

Open-ended questions regarding how the participants learned about performing their jobs well outside of structured training were asked. The purpose of these questions was to get the participant to begin thinking about and express learning experiences on a broader scale. This type of question allowed the participant to verbalize learning experiences that were available outside the structure of the training room. Situated learning theory would assert that these experiences may include personal experiences or experiences where the participant learned by working with someone who was seen as having mastery in the area greater than that of the participant. The original intention was that once the participant was able to grasp and verbalize the nature of the learning experience that was being sought, the questioning would shift to that of learning workplace safety. During the interviews, however, it was also realized that participants were unable to grasp the concept of learned practiced workplace safety. The initial participants were providing knee-jerk responses indicating that their perception of valued and practiced safety was in fact exactly those items provided during the formal safety training. In other words they were providing their learned response to questions regarding workplace safety rather than their underlying beliefs on what they
actually held to be important practices. As a result in subsequent interviews the questioning changed in a manner that allowed the participant to consider non-work related safety practices initially and then move into the realm of workplace safety. This slight change in questioning provided richer data and perhaps a better understanding of the participant’s perspective than would have been available otherwise with the original interview questions, because it captured data regarding learning outside of the workplace.

The researcher was careful not to impart his own standard of what is considered safe, but instead let the participant define what they believed to be safe work practices. During the interview each subject was asked about their experiences of how they learned the safety that is used in everyday practice and the description of those experiences. Prior to the research, it was unclear exactly how many interviews would need to be conducted. Generally phenomenological research requires less than twenty interviews (Cresswell, 1998). Participant interviews were performed until similar concepts were being provided by participants and a relatively high degree of data saturation was obtained (Cresswell). In total twelve interviews were conducted.

Data Analysis

The audio-taped interviews were transcribed verbatim. The transcriptions were done by one of three, paid typists using a micro cassette transcriber. After the transcriptions were completed, the researcher reviewed and edited each transcription while listening to the original taped interview. This was done to ensure the transcriptions were correct in content.
After corrections had been made, each tape was listened to again for context clarity and greater understanding. Each statement of the final edited transcription was then imported into a table of an electronic word processor. These statements were coded numerically to preserve the order of the original interview. This along with an assigned code for each participant, allowed the final statements to be tracked to the original interview for validation. Numbered statements were then imported into a computer spreadsheet and additional columns were added to allow for detailed coding.

**Coding**

Coded transcripts were read and irrelevant statements were removed. This included introductory comments, small talk, and other discussions not pertinent to the research topic. The remaining significant statements were extracted and sorted into themes. The initial coding separated the statements into themes that identified safety behaviors and learning experiences. The statements were then sorted based on these themes and a second coding was performed. During this process statements pertaining to safety behaviors were arranged into sub-themes. This followed the process described by Moustakas (1994) described as horizontilization. In this process every statement was given equal value. This statement had to contain a fragment of the experience that was necessary and be sufficient for understanding the experience, and the fragment had to be possible to abstract and label. This horizontilization was also completed on those statements pertaining to the learning experiences. These statements were sorted and grouped according to themes, which accordingly make up the invariant constituents of the experiences. Samples of 20 percent of
the invariant constituents were validated against the transcripts by another occupational safety professional to ensure that the researchers applied constituents were congruent with that which were expressed by the participant. There were no points of disagreement during this validation process. Once the invariant constituents of the gathered data were validated the researcher constructed a composite description of the meaning and essences of the learning experiences that represent the group as a whole (Moustakas, 1994).

Limitations

One important potential limitation of the study is that the researcher has had exposure to the selected site over the past few years. In this regard the researcher was familiar with many of the managers and some of the employees. To this end, the researcher may have unintentionally influenced some of the responses of the participants to the interview questions. However, due to the rapid growth in the organization over the last few years, the researcher has had little, if any contact with the employees that were interviewed.

This same potential limitation could also have been viewed as a significant research strength. This is so because the researcher had a high amount of internal credibility with the organization, which may have helped to elicit more honest and potentially more accurate descriptions of how learning safe practices occurred.

In addition, while the researcher has had contact with the organization in the past, he has no power, control or direct influence over the employees that were interviewed. Other than developing and delivering content in safety training, the researcher’s relation to the employees has been quite detached.
Summary

In this chapter the methodology and procedures chosen for this study were described. An explanation of the qualitative research perspective and why it was appropriate for this study was provided. In addition research design, population and sampling strategy, subject ascertainment and informed consent were presented. Then data collection, analysis and coding were discussed. Finally the limitations and researcher's personal bias were provided. In Chapter Four, the findings and their interpretation are presented.
CHAPTER FOUR

Findings

Introduction

The purpose of this study was to understand how learning occupational safety practices occurred for employees outside of and in addition to, what was taught through planned, intentional safety training. This research was conducted with a group of employees at a Biotech company in Research Triangle Park, North Carolina. The results of the findings presented in this chapter address the following research questions:

1) What are the safe practices that people have chosen to incorporate into their lives?
2) Apart from or in addition to structured or planned training, how do employees learn the safe practices that they believe are important and have incorporated into their lives?

Once the interviews began, the researcher found it necessary to adjust the interview questioning slightly. This adjustment was necessary since it became apparent that the participants were having difficulty differentiating work safety learning from training. The participants viewed safe work practices learned as a value in their lives regardless of whether they were at the workplace or not. This realization in itself was insightful and is discussed further in this chapter and in Chapter Five. When the researcher first mentioned workplace safety and how safety is learned, participants were quick to respond with formal safety
training as the answer. When one participant was questioned about the safety practices that he chose to incorporate into his life he responded almost immediately, “I’ve had experiences in the lab where you know I had something spill on me and I had to go through all the procedures using copious amounts of water, writing up the incident report, so you learn about those things.” He also discussed staying clear of the moving robots as something he learned. It seemed that the participants were only discussing items on which they had formal training and were answering based on what they thought the researcher wanted to hear. Although this information was important it did not address the question regarding the underlying phenomena sought, which was learned, practiced safety behaviors. Consequently, after two interviews the researcher found it necessary to adjust the questions in order for participants to recognize and discuss real belief and safe practices. The researcher broadened the interview to include non-work settings, by moving the focal point of the interview outside of workplace to explore general safe practices. This allowed the participants to use their outside experiences to frame the meaning of learned safe work practices and gave them a way to understand this meaning inside the workplace. Once the participants discussed experiences and safe practices outside of the workplace the interview focus was moved back into the workplace where they were able to then discuss not just formal classroom training, but learning that occurred in the workplace as well. The purpose of the adjustment was not to exclude formal training as a source of learning, but to prevent the participants from thinking about formal training exclusively. Once the participants understood the concept of learning, the discussion and the descriptions were abundant. Employees volunteered and spoke freely regarding their learning experiences. In fact, on more than one occasion at the conclusion of
the interview when the recorder was turned off, the participant would engage in informal discussions regarding the research. A new thread of information developed and the recorder would be started again as the discussion continued.

Participant Demographics

Twelve participants were interviewed from the target population, which included the described departments at the biotech organization. Demographic information was provided by eleven of the twelve participants. One participant did not complete the requested information with no explanation given.

The participants ranged from 26 to 59 years of age. Four of the participants were female and eight were male. Participants came from targeted departments including laboratories, manufacturing and facilities maintenance. Of the twelve participants four were from laboratories, six from manufacturing and two from maintenance. One of the manufacturing employees was also involved in providing formal technical training to other employees in manufacturing. The participants had worked at this facility anywhere from one to seven years. The facility had been in operation for seven years. All of the participants in this research had held previous jobs with total years worked varying from four years to thirty-nine years. Most of the participants had worked in job positions similar to their present jobs. In other words the manufacturing employees previously held manufacturing jobs including textiles, chemical manufacturing and pharmaceutical. The maintenance participants had held previous maintenance or operations jobs and the laboratory employees had worked in laboratories prior to their present jobs. Two of the participants had military backgrounds.
as well. Although marital status was not asked during the interview, all participants except two talked about spouses and children. One of the participants mentioned that he was engaged to be married. Table 1 depicts the summary of the demographic information.

<table>
<thead>
<tr>
<th>Category</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male = 8</td>
</tr>
<tr>
<td></td>
<td>Female = 4</td>
</tr>
<tr>
<td>Work area</td>
<td>Maintenance = 2</td>
</tr>
<tr>
<td></td>
<td>Laboratory = 4</td>
</tr>
<tr>
<td></td>
<td>Production = 6</td>
</tr>
<tr>
<td>Age</td>
<td>20 to 30 years = 2</td>
</tr>
<tr>
<td></td>
<td>31 to 40 years = 6</td>
</tr>
<tr>
<td></td>
<td>41 to 50 years = 2</td>
</tr>
<tr>
<td></td>
<td>51 to 60 years = 1</td>
</tr>
<tr>
<td></td>
<td>not reported = 1</td>
</tr>
<tr>
<td>Total work years</td>
<td>1 to 10 years = 2</td>
</tr>
<tr>
<td></td>
<td>11 to 20 years = 7</td>
</tr>
<tr>
<td></td>
<td>21 to 30 years = 2</td>
</tr>
<tr>
<td></td>
<td>not reported = 1</td>
</tr>
<tr>
<td>Years work at this organization</td>
<td>1 to 5 years = 8</td>
</tr>
<tr>
<td></td>
<td>6 to 10 years = 3</td>
</tr>
<tr>
<td></td>
<td>not reported = 1</td>
</tr>
<tr>
<td>Total employees in department</td>
<td>1 to 10 = 1</td>
</tr>
<tr>
<td></td>
<td>11 to 20 = 6</td>
</tr>
<tr>
<td></td>
<td>21 to 30 = 0</td>
</tr>
<tr>
<td></td>
<td>31 to 40 = 3</td>
</tr>
<tr>
<td></td>
<td>41 to 50 = 2</td>
</tr>
</tbody>
</table>
Theme Development

A number of themes emerged in answering the research questions: What are the safe practices that people have chosen to incorporate into their lives, and apart from or in addition to structured or planned training, how do employees learn the safe practices that they believe are important and have incorporated into their lives?

Without a predetermined model on which to base data coding, the researcher allowed themes to emerge as the interviews and data were analyzed. The statements were coded using the method described in Chapter 3, categorized and were sub-divided as more learning themes emerged (Moustakas, 1994). The themes that emerged from the participants’ descriptions relating to how safety was learned are listed below. The adjustment to the interview questions also allowed the collection of data regarding safety learned from outside the workplace.

Participants expressed a number of ways that safe practices became important to them, important meaning that they became a practiced value and not just something they were supposed to do. One way of assisting participants to get to this level of understanding was discovered during an interview completed in a pilot study. At that time, the participant was talking about his safe practices and as a result he said, “You will never read about me dying from electrocution in the newspaper.” He used this statement to express how important safe electrical practices were to him. This statement was used as he described an experience as a child in which we received a severe shock. As a result of this experience he became an electrician and developed a deep regard for electrical safety. While maintaining confidentially of the person who made this statement, the example was provided to
participants who were having difficulty understanding the level of appreciation of the phenomena sought in the research questions.

The results of the data are presented from the themes established during the coding process. The themes are presented in Table 2.

Table 2: Themes established during coding

<table>
<thead>
<tr>
<th>Number</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Learning from family</td>
</tr>
<tr>
<td>2</td>
<td>Learning from Friends and Acquaintances</td>
</tr>
<tr>
<td>3</td>
<td>Learning in the Safety Classroom</td>
</tr>
<tr>
<td>4</td>
<td>Learning from other’s experiences</td>
</tr>
<tr>
<td>5</td>
<td>Learning from first hand experiences</td>
</tr>
<tr>
<td>6</td>
<td>Selecting a mentor</td>
</tr>
<tr>
<td>7</td>
<td>Learning from a mentor</td>
</tr>
<tr>
<td>8</td>
<td>Being a mentor</td>
</tr>
<tr>
<td>9</td>
<td>Learning from others within a workplace community of practice</td>
</tr>
<tr>
<td>10</td>
<td>A learning community</td>
</tr>
</tbody>
</table>

Separating experiences and learning opportunities proved challenging and the researcher was concerned that doing so would result in an overall disservice to the presentation of the data. In addition experiences and learning opportunities are presented in a way that might imply that they occurred in a simple linear fashion when in fact they did not.
The participants’ learning situations were described with more of expansive rather than linear quality. This was reflective of the nature of learning through experience described by Dewey (As cited in Tennant and Pogson, 1995, p. 153) when, “every experience should do something to prepare a person for later experiences of a deeper and more expansive quality. That is the very meaning of growth, continuity, reconstruction of experience.”

Another concern was that by separating the experiences into themes the data tend to isolate the learning not just from the content of the experience, but also from the context of the individual’s life experiences as well. When considering that an underlying objective of this research was to better understand the phenomena of learning within the context of the experience, then certainly some meaning could possibly be lost in attempting to remove it from the context in which it resides.

The learned safe work practices are presented within the themes that describe the learning processes or experiences that occurred. The researcher believes this provides the data in a way that is more meaningful since the learned concept or content that was most often described with the context in which it was learned.

*Findings*

The central focus of this research was to understand how learning safe practices occurs within the workplace. The data gathered and presented from the interviews indicated that learning safe work practices regularly occurred within the workplace through situated learning and the process that Lave and Wenger (1991) term legitimate peripheral
participation. The interviews provided the following descriptive data regarding how learning occurred for these participants and is presented in a format that attempts to follow the learning through a developmental fashion from an initial experience or peripheral awareness of safety issues, to how learning developed through apprenticeship or mentoring, and ultimately how learning was enhanced while the participants acted as a mentor to others (Lave and Wenger, 1991).

What was discovered through the interviews was that an appreciation for the practice of workplace safety often required that the participant had to first recognize the value of incorporating this into their practice as described by (Tennant and Pogson, 1995, pp.154-160). The participants’ learning an appreciation for workplace safety as a personal value often occurred through lived experiences, usually the witnessed or shared experiences of others, and seldom did it occur exclusively through the structured knowledge provided during workplace safety training alone. Once the appreciation for workplace safety was established for the participant they reported that they often sought to further their knowledge or understanding by seeking a mentor, knowledgeable co-worker, or through formal workplace safety training. Many of the participants also described a sense of obligation to co-workers by becoming mentors as they in turn informally taught or shared their understanding and knowledge regarding workplace safety with other workers. In many cases the role of apprentice and mentor occurred simultaneously for the participants as they moved through the workplace community of practice from a peripheral to central role. They provided knowledge to co-workers while at the same time seeking knowledge from other workers in another aspect of workplace safety. Playing the role of both givers and receivers of the
knowledge generally occurred outside the formal workplace safety training opportunities and in some instances it was used to rectify erroneous information that had been provided during the formal safety training.

It was also discovered through the interviews that initial recognition of the important safety values and consequent learning often occurred outside of the workplace and was then brought into the workplace and incorporated in daily activities where the practices became part of the workplace safety repertoire. While the limitations of this research only allowed these outside experiences to be described briefly, the researcher does not want to downplay the role that the non-work related learning experiences had on the participants and how the experiences impact the learning of workplace safety. As discussed through these non-work experiences and their impact it became clear that as Wenger (1998, p. 158) states, “Our membership in any community of practice is only part of our identity.” Clearly who the participants were at this particular work setting was only one part of their identities. These outside experiences are presented first since they often had an impact on the participant and provided a lens through which work related experiences were perceived.

*Non-Work Experiences*

The data gathered during the interviews regarding non-work safety was gathered as a result of the researcher restructuring and broadening the scope of the interview questions. When the focus of the interview was directed to the non-work setting to allow the participants a better understanding of learning safe practices, the description of non-work
safety learning became part of the data. What was described showed that most of the participants did not necessarily perceive non-work related safety as being conceptually independent or separate from workplace safety. For example if wearing personal protective equipment was important at home, perhaps while bicycle riding, it was also generally perceived as important at work. In the researcher’s experience most safety professionals treat these two worlds, work and non-work, as separate, with merely an occasional mention of non-workplace safety, which is discussed in more detail later.

As non-work safety practices were coded the two major themes that emerged were experiences with friends and experiences with family, which seemed to be the other two major social venues for learning experiences. The lessons that were learned outside the workplace were assimilated easily by the participant and applied inside the workplace, including the lessons learned within the family.

1. Learning from family

Every participant discussed learning safe practices from family and in doing so it became clear to the researcher how many of the values and lessons learned regarding safety outside the workplace effected the participants perception regarding safety inside the workplace. These family values often provided a framework on which the participant built and refined their understanding of work place safety.

Greg had developed a high level of workplace safety awareness regarding electricity. He presently works in maintenance and has had numerous opportunities throughout his adult
life to work with electrical installations. He previously worked for a power plant and was an electrician in the Navy. He believes his work practices regarding electricity are very safe and deliberate. He attributed much of his present conscientious safety attitude and work practices regarding electricity to a learning experience he had as a child. As he related the story he personally ties it with the symbolism of Christmas and the great respect he had for his uncle. In fact the vision was so memorable for Greg that, unlike most participants, he mentioned it within the first few minutes of the interview as soon as the concept of safety learning was discussed.

One of the things that popped into my head was my uncle who I really loved and I thought he was one of the brightest people I had ever met. He was an electrical foreman, so I went over to his house at Christmas time. Now we would go in the corner and here is this wad of plugs, all these plugs plugged into each other and plugged into the wall, and so I didn’t say anything.

I was probably 8 or 9 years old. Old enough to start paying attention. Then after we left I talked to my dad about it and my dad said, “No, no you never ever do that,” and he explained why. So little things like that start sticking in your mind and the kids at that age you are eager to learn and you learn a lot quicker. Something like that stuck in my head.

The things that dad pointed out was the potential for fire. One of the happiest times of the year. He pointed that out real quick.

This image of Christmas and the potential for a fire at his highly respected uncle’s house provided a value and learning opportunity for Greg that carried into adulthood and his work. He recognized this story as playing an important role in providing the foundation for the safe electrical practices he uses today.

Mary talked about her safe behaviors in very general or broad terms. Later she described situations where co-workers performed unsafe acts and described this behavior as
“risky”. Instead of providing information regarding very specific safety behaviors, she talked instead of broader concepts such as taking risks. This concept of being risky was developed when she was younger and discussed it in relation to her upbringing. Mary saw herself as “fearful” and non-fearful people or those who did not practice safe behaviors were “risk takers.” Mary said she established this “fearful” personality and her concept of safety from her parents.

I think it was because my parents were always taking precautions. You know they were always the type of people who, if we were outside in the yard and a car was moving you’d get over out the way. Or it might somehow lose control. They’d always said, “No, you stand over here out of the way.” Or maybe I might be getting a knife out of the drawer handing it to my mom. My mom always said to hold the blade down. And it was just different things like that. I think that was instilled in me to always be cautious.

Mary discussed a number of ways in which her parents focused on safety during her childhood. Most of the stories or lessons she learned as a child were general information regarding safety, often relating to the hazards within a certain space such as around a car or near a machine. She could not recall many specific incidents or experiences that occurred. In workplace safety she spoke in these general terms as well. While she provided a few learning experiences as an adult, most of her perspective regarding workplace safety was broad and non-specific. She believed she just practiced using good safe practices and avoided taking risks. She “toed the line” as an adult. Other participants had developed this same general broad awareness regarding workplace safety.

Like Mary, others participants had developed this low risk or fearful perspective outside the workplace, usually in a family setting. Trent talked about his self-perception and general heightened awareness regarding safety. As the interview evolved he began to discuss
his upbringing and the role his parents had in developing this level of awareness. He likened
this perception to being “paranoid” and believed that this perception came from, “Just seeing
things in the world. Sometimes it’s like a horror movie.” He also saw his parents having an
influence on this perception. “I think my mother and father are very paranoid about things. In
fact I am certain I got this from them.” His father apparently believed in using “what if” type
scenarios to teach his son safety. Trent likened it to a presently popular book.

My father was constantly lecturing, “what would you do?” when I was a
kid, he would give me for instances, “what if I got shot, what would you
do?” My head was full of that stuff. You know the worse case scenario
book? That’s kind of how my father is. He is very good at everything he
does but he doesn’t do a lot of anything that would be considered sort of
“outgoing.” So I tried not to be quite so bad. I am not calling that bad, it
is safe behavior not necessarily bad, but in some people’s minds it shuts
you off from experiencing things because you are closed off to do
anything. There are no risky behaviors. I don’t tend to be a bungee
jumper.

When asked if this upbringing had an impact on his general attitude toward safety he stated,

Without question, Yea. That was his way of trying to teach or maybe
make us somehow understand the way he wanted it. For him it was a
way to explain it to me. I am that way without question. If you are
playing a sport, you are wearing the equipment. If you are doing this
you have got to make sure you watch out for this, this and this. Carry
the first aid kit in your car kind of people. I got a lot of that and there
was no question that it came from them.

Trent believed that his upbringing had affected his general awareness. He
stated, “Did my parents have an effect on how I operate at work? Oh without question.”

Though the focus of this research was workplace safety, much of the learning that occurred
was based on experiences and opportunities outside the workplace.
2. Learning experiences with friends and acquaintances

A number of the participants discussed situations where they learned the value of safety and the incorporation of a safe behavior into their practice through experiences involving friends or acquaintances. While a number of the experiences involved actual friends of the participants, there were also a number involving people who were known only through association. Occasionally the learning experience or affordance was simply a story told to the participant by another person, such as a friend or family member.

Trent was very intent on the use of personal protective equipment (PPE) in the workplace. His belief in the use of PPE however, was based outside the workplace and included the regular use of PPE when riding his bicycle. He spoke at some length about riding his mountain bike and bicycle safety. When questioned why he believed so strongly in wearing PPE while on his bicycle, he related a story about a relative by marriage, involved in a motorcycle accident resulting in a head injury and long-term neurological problems.

A family friend had an accident on a motorcycle and he crashed into the side of a van and he was going pretty fast. He will never be the same. He is really, really impaired. If you want to teach helmet safety – there is no better way. Take somebody that is already on the cautious side (referring to himself) and have them experience something like that – the gentleman is super nice but he is just not the person he once was.

This experience had a big impact on his concept of safety and belief in wearing PPE. The picture that it painted for him represented not just an injury, but a deeper understanding and appreciation of that the overall impact of the injury had on the person’s life and family.
I was probably ten or twelve. They were people we would go out for pizza with all the time. His name was Ken and he was super nice, just a great guy. And then just after… most of the story my mother reported, but things before were wonderful then aside from the physical problems everything was hard. He is just not all there and it just affects every aspect of his life and his wife’s life as well, and that’s a huge learning experience. That’s a lesson that you just don’t ever forget.

Prior to this experience his helmet wearing behaviors were what he felt to be very typical for a child. When questioned he responded, “You know I honestly didn’t think about it a lot. My parents always said to (wear it), but I know I would go without sometimes. You know kids, if I was just riding down the street.” After this experience his belief and his behavior changed dramatically. “I tell you what, after that I wore my helmet. I didn’t screw around with it. There is just no question. It’s just not an option. It’s just which one am I going to wear, not if I am going to wear one.”

He commented that this lesson resulted from his total personal perception of the accident, not just his parents’ use of the story to try to “teach” him.

I don’t think that was so much my parents beating that into me like (saying), “just think of Ken when you ride your bike” so much as my recognizing the whole thing. I wouldn’t have needed anybody to tell me anything about it. I didn’t need anybody to summarize it for me. I got it.

Thomas also had a learning opportunity that was a personal experience that resulted in a lesson taught by a friend. As a child, he had an accident on his motorcycle that was the result from his hesitating to respond. He relayed this information to his friend who was quick to reprimand him. He described the situation with great detail and how his friend’s reprimand had an impact.
I want to do a good job and safety is a big part of your job in this industry. I have had an experience where a guy got hydroxide in his eye and it just goes back to the motorcycles in a way. I remember one time when I was a kid I froze and I ran into somebody. They pulled out in front of me but I couldn’t move, I froze and I ran into them and it flipped me over and threw them in a ditch. Neither one of us got hurt, but when I got back I was telling one of my friends who was older than me. I told him that I froze. As soon as I told him that he sailed into me. “You don’t ever freeze. You always pay attention.” And ever since then I remembered that. You have only got two or three seconds at the time of an accident to keep focused. I remembered that. I remembered it my whole life. I think I was about ten or eleven. I just always from that moment I try to keep my eyes open and look and pay attention to my environment.

The lesson learned was “don’t hesitate, you must react quickly.” He believed that this experience was the basis for his quick reaction when assisting a co-worker.

This guy up there he was adding sodium hydroxide. We were doing it and somehow there was a flake of hydroxide on the bag. When he flipped it, it flipped underneath. He had goggles and glasses on and it flipped underneath and got in his eye and it was bad. Instead of freezing, I heard this guy. He tore his helmet off and I heard him screaming. You think that you get a piece of hydroxide in your eye you can find an eyewash, but you can’t. We had a water hose, just a regular city water hose that we were using and it was just instinct. I held the water and sprayed him in the face and we flushed it. His whole membrane of his eye came off. He went to the hospital and they checked his eye. He didn’t lose that eye. He lost no vision in it. And it was from a quick response.

He discussed his sense of responsibility and quick reaction, which were the behaviors that he learned. He attributed it to his lesson as a child. “’Don’t freeze,’ I really do think they were both associated in that sense. Probably from that moment there have been plenty of times when not freezing helped. Just from having that chewing out.”
This quick reaction concept learned outside the workplace by Thomas was similar to the quick reaction learning that occurred by James inside the workplace. It was not a concept that could easily be taught in a safety training program, since again this is tacit knowledge. In addition to this concept, a number of the participants had developed a level of safety awareness that was built on the concept of spatial relationship to the surroundings. Most of the participants discussed that this concept was regularly used inside the workplace, yet all of the experiences where this was learned occurred outside the workplace. James had this heightened level of concern and related it to “children running into things.” Though the researcher had an idea of the concept the participant was trying to describe, he asked for clarification.

You know at home, the kids are wild, running around, they just play all the time. And I just try to kind of maybe move things out of the way. They always have a way of getting hurt and I try to move tables or sharp pointy edges that are kind of bad. If I see them playing or if I’m playing with them.

The participant had a difficult time expressing where this concern and heightened level of safety regarding “running into things” originated. He could not recall why he had this level of concern. After some discussion and delving deeper he recalled an incident with a past girlfriend and responded, “I actually I had a girlfriend whose son was jumping fences up in the city on one of those metal fences…. he slipped and fell and one of them went into his eyes and he lost his eye.” Although this incident was never described as a single learning opportunity, it was prominent in his discussion regarding the safe practice of moving objects that could result in injury. This concept of safety in spatial terms reoccurred through various themes and is discussed further in Chapter Five.
Thomas discussed his safe practices in terms of this spatial relationship as well. He talked about operating machinery and his level of awareness regarding his surroundings. He also had a heightened sense of caution whenever there were people, particularly children, around his personal powered vehicles such as car, backhoe (which he owned), and riding lawnmower. He expressed this by saying, “I am very cautious with the kids – as like anytime you get in a car – anytime I am on my back hoe – any time I am driving something or operating something at the house. I am not going to even move until I know where they are at. In all reality I think I might be a little paranoid in some ways.” When the researcher asked how he developed this level of concern he provided a story regarding a neighbor.

Thomas: I know that when I was a kid I remember my neighbors, their boy was the same age as me. Their little girl about three she got run over by her uncle. He ran over her in the yard because she crawled up under the truck. I remember that story. They were all hanging around like a family reunion and the baby was playing out on the ground and she crawled under the truck. Nobody was paying attention, he got in the truck and drove off and he ran over her. I remembered them telling me and I remember them going every weekend to go visit her (cemetery).

Researcher: How old were you?

Thomas: You know, I was probably the same age (as the brother) probably around 9, 10 or 11. The girl had she lived she would have been older than me. To watch my friend’s mother go on Sunday to the grave and put flowers on her daughter. It is so easy if you think about it. They were probably drinking or something like that. No telling, got him a new truck or something and boom, that accident happened. Whose fault was it? You never know.

Researcher: Yea. Lot of times fault is hard to blame. That is something to remember.

Thomas: And I pay attention to it at the house. I watch not only for me but people that drive up in my yard. They are not going to leave until I know where the kids are.
Researcher: Do you think it is because of that incident?

Thomas: I think it is because of the story. I think it is because of that and I could see the potential, it could happen. The kids are riding a bicycle in the yard, or me on my backhoe and you get to working or doing something in the yard. You know you are not really paying attention. A 3-year-old boy, what’s he going to do if he sees a backhoe? So you know the best thing to do is not to be running it really when they are out.

Researcher: Does that thought kind of cross your head when you are on your backhoe, do you think about your neighbor?

Thomas: Yea, I think so. I don’t know if it is the neighbor event that I think about every time but I think about the potential of an accident happening or somebody running up to me and not seeing them.

Researcher: And how that has impacted their life?

Thomas: Yea, and then seeing that it could happen. I don’t know if I could live with that happening. That would be tough. I would rather do the other, be super cautious and super nervous than just be hazardous and crazy. You know I don’t feel like I am over sensitive if I am riding my lawn mower or if I was doing something really easy, like if I was just riding around with it. If I had the boy on the back hoe with me, but I know where he is at.

While the participant did not personally know the child who died, he knew the family. His connection with the brother as a friend and his witnessing the grief that the mother held watching “her go on Sunday to the grave and put flowers on her daughter, because she got run over,” created a deep sense of connection in his personal life. He described the experience in way that indicated it was more than just a tragic story. The fact that he never knew the child indicated the event itself had less relevancy for him as the impact the event had on the family. It was an event that altered the way a family lived and his witness to this alteration was all he knew. He recognized that the way this family lived was all related back
to a tragic incident caused by an act of lapse in spatial awareness. He stated, “It is so easy if you think about it. – got him a new truck or something and boom – that accident happened – whose fault was it? His fault for driving or their fault for not watching the kid? You never know.”

Finally, Betty also talked a great deal about “general awareness” and “just seeing things and what was happening.” Much of her discussion portrayed safety in terms of spatial awareness as well. She discussed playing softball and what being safe meant.

I find a lot of people just run into each other kind of say to catch a ball or something like that and I guess just being more aware. Just people know where they are at, communicate with each other, or If they are not calling the ball, not knowing how close they are to you. Where is the fence? Were you at the warning track? Did you your teammate call to you the fence?

Later in the interview she indicated that this general sense of “awareness” was instilled while she was younger and although she cannot relate this sense to anything specifically she discussed her job as a supervisor lifeguard in regard to safety.

I used to be a life guard in high school and the early couple years of college and hoping that all the life guards are aware of what is in front of them – if not, I was the supervisor and would maybe just walk up to them and casually talk and say have you noticed the kid over in the green trunks – keep your eyes on him.

She had an experience while being a lifeguard where she had to rescue two children from a pool.

I: I did that. That would have been my senior year. I worked at a public pool in my hometown. We had a little kid go off the diving board and he struggled a little bit and we had a buddy jump in after him and he
was on top of his head but they were going up and down and I was under the big stand that day

Researcher: You were the lifeguard on the big stand that day – were you the supervisor?

I: I was.

Researcher: Okay. You were aware of your surroundings that day.

I: Yes. I tried to be.

Researcher: And that shook you up.

I: It did – the adrenaline rush by seeing a kid drowning and I know I dove in and I came up and I did a rescue from the back so there was no vision but the two kids on top of each other – they were under water so I grabbed one kid and pulled him to the side and the other kid I was able to get him and do the crossover and pull him to the side and once all the kids were to the side and we had checked on them and made sure everything was okay.

She mentioned the importance of awareness while being a lifeguard. Know where the children were and being able to see them in the pool. She emphasized, “Just the opportunity of someone drowning there and you are in charge – that is enough stress in itself – you are going to make sure that you aware because it doesn’t take but a second.”

All three participants had learned this concept of spatial awareness from experiences outside the workplace, yet all used the concept inside the workplace.

Some of the behaviors the participants learned as the result of experiences with friends that were less related to specific incidents and more related to general association. For instance another participant’s friends created peer pressure that supported safe behaviors. Unlike Thomas’s friend with a harsh reprimand, Betty’s friends created an environment with a positive approach. Her group of friends (community of practice) in high school made it a
point to wear seat belts. She stated that at the time it was not the law, but described it as
“them all watching out and reminding each other.”

I think we all sort of would check behind each other – just to remind that everyone is wearing a seat belt – especially in the 80s and when I was in high school so we were riding around town and things like that so if you stopped to speak with friends or if you were going to another car – I guess just a little reminder or to see who was actually wearing the seat belts – if it was a big thing – you know it was not mandatory but you know – okay – so and so wears a seat belt – that’s pretty neat.

She discussed this as creating an atmosphere that encouraged seat belt use. She talked about this in a way as if wearing seatbelts was just the expectation or part of her culture. She again, did not discuss specific events, but described this as a general learning experience.

Lillian was focused on fire prevention and fire safety. Having a friend whose house was burned down heightened her concern regarding fire safety both at work and outside work. Throughout the interview and regarding all of her learning experiences, she focused heavily on the importance of family. Her children and their safety was a driving force in her seeking more knowledge regarding safety. She was certainly aware of the injuries and tremendous financial loss that could occur as the result of a fire. Yet, in her concern regarding fire safety and her experience with the friend, she also looked beyond these concerns and related to the emotional loss. She related the heighten awareness of emotions to the personal items related to her children. She stated, “I know I’m fussy now (regarding fire safety). I’ve had some friends whose homes were burned down. Yeah, it’s really horrible. To know someone who lost their pictures of their little children and their videos. Yes, I had a couple of friends who’ve been through that.”
3. Learning in the Safety Classroom – “Great For The Basics ...Then Get the Real Safety Information From the People on the Floor”

A number of participants discussed the impact that formal safety training had on learning safety. This training might include classroom, computer based training, or videos. The formal safety training experiences that were reported during the interviews described a full spectrum of perceived value from very good to very poor.

After almost reflexively relating safety learning to safety training in the first interviews, a few participants later returned to safety training as a learning opportunity and discussed it in a different light. For example, when asked early in the interview about learning safe work practices Trent stated, “I would have to attribute most of it, the majority of it, to the (formal) training.” Later in the interview he began to discuss personal experiences that really spoke of his learning and incorporation of safe behaviors. In fact he provided some of the richest detail in describing a repertoire of shared learning experiences within his department community of practice. Though he continued to discuss his high regards for formal safety training, he also talked freely about other learning affordances that were provided outside the classroom.

A number of the participants initially reported that the formal safety training they received was beneficial. As mentioned, Trent stated, “Lately we have gotten some really good training and I think most people are really bringing their level up.” He went on to stress the manner in which the safety training was delivered was important. “An example makes a lot more difference than looking at pie chart…. its easier to listen to a story than data.”
Other participants similarly reported the safety training sessions that resulted in the most learning were those who included a story or example. Andy talked about a first aid class he had taken, “I think the ones that really hit home best are the ones that are familiar to you. Those sorts of stories that are presented by somebody who has seen them first hand so you know that first of all they’re telling the truth but second of all they’re real familiar with what happened.” One experience where he was most impressed was when the instructor discussed how to take good examination notes when treating an accident victim. “The guy that was teaching us was actually giving us an example, he was showing us these notes about somebody who was in a motorcycle accident who was thrown 75 feet. The guy was actually teaching. It was him!”

Stories were also reported as being a rich source of learning if they were provided during other forms of safety training such as videos. Ryan stated he was most impressed with videos that had a story, “when you see somebody that’s talking to you that’s burned over 90% of his body, you see the before picture, you see the after picture. He tells you, I did what all you do all the time which is take the short cut.”

James’ feelings were similar when he reported, “I’ve seen those safety films where people got nailed in the eye and you don’t want anything like that to happen to you.” Similarly, Andy also stated, “I think when you find something that’s really personal (from a story) it’s an unfortunate way that that’s how some people learn. It’s probably the best thing, the best way for me to have learned.”

A number of the participants discussed their formal safety training as just an additional source of information for learning, though not necessarily their primary source.
Steven reported this a number of times. Early in the interview he said,” Well, most of the safety stuff seems to come from class, but there’s stuff that you may not learn in class.” The researcher spent some time exploring this and later came back to safety training. Steven stated, “I’d say on an average maybe one or two real good nuggets of information, that I didn’t know, will come out of my classroom training. I’m definitely not saying the classroom is useless, but I think it’s not as effective as everyone would hope it is or believe it to be. I mean I just feel its (classroom) another source to pick out some information.”

This idea that formal safety training was seen as a supplement to the workplace learning was repeated throughout the interviews. Comments were made a number of times regarding how real information would be obtained once the formal safety training was conducted. Steven said, “I mean my biggest thing is classroom training is great for the basics….then I go get the real information from the people on the floor.” Or another participant commented, “And so we did have to have a formal classroom for electrical safety …. once you got away from electrical safety, that was pretty much the most formal part – then everything else was just OTJ (on-the-job) type training.”

When asked about learning situations and safety training, one participant who was experienced as a trainer, reflected on its impact. He had earlier provided very graphic situations where his safety learning was established through experiences. Regarding formal safety training he had provided he stated, “I don’t want to say that it’s because or not because of training. I like to think that because I told them to do this or don’t do this. But realistically I sense that there are other experiences that kind of give them that connection.”
A considerable amount of the safety training described, particularly at the participants’ previous jobs, consisted of viewing videos. Participants voiced a love hate relationship regarding this type of safety training. For some there was a sense of gratitude for this type of training. While working for a building contractor, Ryan talked about how he felt his manager was concerned for their safety. When given a power nail gun he stated, “We had to sit and watch a videotape on the back of his pickup truck about the safety of it.” He had a high regard for this foreman and believed that the showing of the videos was more of a representation of the foreman’s concern for them than perhaps an actual safety-training tool. In fact it was after watching the video, which included an x-ray of someone who had a nail in their skull, that the employee and a co-worker used the power nail gun to shoot nails at a wall. The following day the employees were reprimanded by the foreman for this act, which then resulted in their safe use of the nail gun. The fact that the foreman showed the video and reprimanded them was what indicated to Ryan that the foreman cared resulting in his changed behavior, not the content of the safety video alone.

Some of the participants gave the impression that some types of formal safety training were more of a commodity than perhaps a learning opportunity. Ryan discussed safety training in the Navy, “Yeah, that was our safety training that we had monthly. So he always had some kind of tape. We used to hate watching tapes, but it was something.”

Similar feelings were expressed by Kyle, “Generally, it’s not taken real serious by training or anything because it’s more of like, I’m not saying the place I work now is like this but, in past experiences I have seen where training is taken as kind of “it’s got to be done”, you need to do this, it is supposed to be done. Not that they want to do it and they want you
to be safe. It is just more or less a formality.” He went on to say, “Well just by past experiences I’ve been in, when the safety classes are going on you feel rushed. You feel like they want to spit the information out there as fast as they can and be done with it and get on.”

Some participants expressed that training did not necessarily lead to learned safety behaviors. Thomas had written a paper in a college class on occupational noise exposure. He was proud of the paper and the fact that he had a fairly good understanding of hazards and controls associated with occupational noise. When asked about his personal behaviors regarding noise and hearing protection he indicated that he tended not to be very diligent about wearing hearing protection. He stated, “You know I have had the safety classes and stuff but...nobody wears ear plugs like they are supposed to.”

Steven displayed an element of cynicism in his tone when he discussed his experiences with safety training. His belief was that the formal safety training lacked credibility if the trainer did not have the workplace experience. “I mean everybody jokes about it because its like, “Oh no, another training class. You have somebody from the safety team or what ever teaching this class, but you don’t ever see them on the floor you know, handling it like you handle it, doing it like you’re doing it.” He went on to say, “You’ll see people in manufacturing looking around going, ‘He don’t know what he’s talking about. We don’t do it like that.’ And, “ That’s not how we do it in the back’ So you just kind of get in the habit of training so you can say, ‘Okay, that’s one thing over, now tackle the next one’. And you’re kind of doing it to get it under your belt not just to get the information.”

One of Steven’s concerns with the formal safety training was that frequently everyone in the class exhibited varying levels of understanding and knowledge. He stated, “If I’ve
been doing it for five years but I’ve got to re-train and somebody else hasn’t been doing it at all, they start with very simple stuff. Then I instantly tune out because I already know it.”

Another concern that he had with the formal safety training was that there were sometimes inconsistencies between that which was taught in the class and what actually occurred on the job. Steven had described a situation, that was described earlier, where misinformation was provided in the formal training of the SOP that resulted in a co-worker being injured. He expressed his guilt in not having provided the co-worker with the correct information. He believed that this happened more often than most trainers realized. As he discussed a similar scenario he said, “They showed me what happened if you did it like they showed you in the class and you know it wouldn’t make sense.” He believed that in the classroom the students were uncomfortable conducting a dialog with the instructor and so the training becomes a one-way flow of information. “There’s too much social pressure in the classroom; you’re scared to ask questions...after class everybody’s asking the questions to each other. They’re asking each other which is basically the same thing as when you’re on the floor.”

Steven’s remarks indicated that in certain settings if the training could not be trusted then it was disregarded. This type of learning appeared to be similar in nature as that which allowed the participants to recognize from whom not to learn. In other words, if the required formal training was not conducted properly or misinformation was provided, the participants learned to ignore it and afterwards they sought or provided each other the learning that was needed to perform the job safely based on the experience that they had.

As with the mentoring role, where the receiver and giver both were afforded learning opportunities, formal training offered this same dual opportunity. Learning occurred by being
a participant in formal training (receiver), and also training or discussing needed information with co-workers (giver). A number of the participants had opportunities to be in the formal trainer role and discussed this role during the interview. Being a trainer provided them with a chance to lead by example or increase their interest and knowledge level to the point that they felt comfortable in training others.

Lillian discussed her experiences as a formal safety trainer and the expectations she developed. “I’ve had good trainers and I’ve had bad trainers and then I was a trainer, so I’ve sort of been at all ends of the spectrum there. When I was being trained, it was very frustrating to not get good training where I really expected to be trained well.” She tried to remember what was lacking in the safety training she had received and tried to make adjustments in the classes she gave. She stated, “I made sure they had all their safety training but we had requirements within the department of course, so we had videos that were required, we had some classes they had to go to or whatever. But what I did that most people didn’t do is I made sure…we went through all the MSDS sheets for all the chemicals.” She described the same sense of responsibility that was discussed as a mentor during the mentoring process, “When I became a trainer I’d actually been through quite a few years of other things where I had been trained. I had taught many procedures to people. I had been the victim of bad training in a few instances. I’ve witnessed a lot at that point. I had witnessed so much irresponsible behavior at that point. I said that’s not going to happen as long as I have anything to do with.” She spoke of formal safety training as an efficient, planned method of providing information.
In general, formal safety training was the easiest to discuss initially in the interview, but then provided the greatest variation in effectiveness as a tool for learning. Most of the participants reported formal training was of one of many learning opportunities regarding workplace safety and a valuable resource for providing information regarding safety. For many of these participants the personal value or importance of workplace safety was already determined and the formal safety training was a tool that delivered more specific information. Some of the participants discussed the inadequacies of formal safety training in the overall learning experience and some talked about the problems that were present when the information in the formal training did not coincide with the reality that they faced on the workplace floor.

*Learning The Value Of Workplace Safety Through Experiences*

The participants described numerous workplace encounters that provided unstructured, informal, yet seemingly very significant opportunities of learning. These opportunities and the process of learning safe work practices often began with experiences that provided the participants a sense of the true value rather than just knowledge of workplace safety. This value was then built upon through other learning opportunities. In other words safety became a value from the experience and as a result more knowledge was sought to enhance that value. This process reflected what Dewey defined as the principle of continuity (as cited in Tennant and Pogson, 1995). At other times the value or importance of safety was developed outside of work and brought into the workplace.
The learning that occurred reflected broad concepts of workplace safety rather than specific content-based issues. These concepts were formed within the context in which the experience existed. A number of the participants described very similar concepts regarding workplace safety such as: spatial awareness, the importance of reacting quickly and the use of personal protective equipment paired with the use of emergency equipment. These concepts were considerably different than the content groupings that are often delivered through formal safety training. Participants also believed that an important part of their safety learning included awareness of which employees to seek as mentors for learning safety, or they learned from who to follow (learn) and from who not to follow (learn) for safe behaviors. In other words, they learned how to select mentors.

In general, it was found that experiences could have been described as positive experiences or negative experiences with substantial learning opportunities available from either type of experience. In other words, the importance of workplace safety was conveyed both through the experience of doing it the wrong way resulting in an incident, as well as doing it the right way and averting one.

While injuries and incidents had been recognized as a source of learning information for safety professionals for years, historically they had been treated either as a statistical source of information, as a reference point for implementing some type of hazard control (i.e. engineering, administrative, etc.) or as an indicator for implementing more training (O'Reilly, J. 2001, pp. 100-131). Generally incidents have not necessarily been viewed as a basis for developing mastery in performing a job safely. What the participants described was that these experiences were not necessarily seen as a source of information for safety professionals but
instead personal development tools for the employee that allowed them to understand and appreciate the magnitude and importance of workplace safety as they developed mastery in their job. In reality these experiences may go unreported for fear of reprisal from management and in cases where the incidents were reported, the employees may be treated like mavericks who had not followed the safety rules. According to the participants, informally these experiences are shared among co-workers and used as learning opportunities for mentoring others, formally these employees are seldom used as mentors by safety professionals, trainers or managers.

4. Learning From Other’s Experience – “Seeing is Believing”

The learning affordances that occurred through association with co-workers were a key resource for most participants. As mentioned, with the focus on learning and not specifically on formal training, it took the participants some time to understand the experienced phenomena that was sought. Once understood, however, the descriptions from the participants were readily provided. These learning experiences consisted of watching, communicating and interfacing with other employees in a variety of workplace settings. Many of the “lessons learned” were carried over from previous jobs. As stated, the learning that occurred with co-workers followed both positive as well as negative experiences. For example, one participant witnessed an eye injury resulting from a co-worker not wearing safety glasses, which was as powerful a learning opportunity as another participant’s witnessing an eye injury that was prevented by the use of safety glasses. What also was frequently reported as an immediate negative experience (injury of a co-worker for example)
resulted in a decision to seek a positive role model for learning. Such a role model was often a very conscientious co-worker, who as one of the participants described, “you could just tell that they were doing it for the right reasons and they cared about what they were doing.”

Of all the experiences, one of the more powerful learning experiences described by a participant was the unfortunate death of a co-worker. Ryan described this experience as having a major impact on his appreciation for safety as a value and his total commitment in workplace safety. Although he did not pinpoint any single safety behavior that he changed or incorporated as a result of the accident, it did have a dramatic impact on his overall perception of safety. He conveyed the story very early in the interview as soon as the researcher presented the concept of workplace safety learning. For Ryan it was not necessary to focus the discussion outside the workplace in order for him to understand the concept. As soon as learning safety was mentioned he brought up the incident. The experience was so powerful for him that he recognized it immediately as an important personal learning experience. It was apparent from his description that this event was a major contributor to his appreciation and subsequent learning of workplace safety.

I have seen guys get killed that was a big one. The guy fell in a pit of water that was being blown out of a boiler at a high temp (temperature). What happened was we were walking through and they had a bunch of piles of grates of grating material piled in these piles. And they hadn’t gotten to covering up the stuff that they were required to have covered up prior to us doing these boiler blowouts. So they were kind of behind on that part of the aspect of construction. Okay we will get it done as soon as possible and they overlooked it and that night we had a problem with something we were working on – a piece of equipment we were working on and the shortest route of course, a mouse takes the shortest route and so you have got a wall here and a wall here – a door goes out right here – well there’s an opening through the wall right over the top of that pit and that pit they had taken plywood and shoved up underneath the metal plating for the pumps to cover it up and I
remember stepping over it – I didn’t step on the boards – I remember stepping over top of it and the steam coming up and me going – man – you know you think about it after the fact “ah man I can’t believe I did that.”– that was an 18-inch opening and that guy must have fell perfectly straight through or he dropped something and climbed down to get it out and thought he could get out and he didn’t – that’s the only thing we can figure out. That was a rude awakening right there.

As Ryan provided a great deal of detail in relaying this story of the tragedy, he recalled the emotional impact it had not only on himself, but also on other employees as well as the lead operator. He discussed how he had just seen the co-worker prior to the incident and how he and other employees had heard him scream, but were unable to retrieve him from the scalding water. From the researchers’ perspective many employees never witness a real life experience of this magnitude first hand. As a result of his experience Ryan described learning a profound appreciation for workplace safety in general. Shortly thereafter he became actively involved in the workplace safety program. What became important for Ryan was not merely learning the dangers of working near an unguarded floor opening, but the lesson went far beyond that. He discussed the general irresponsible nature of the employee who died. He discussed general feelings of the experience, the night, the anxiety in trying to get him out, the empathy he had for his manager who was working that night and had to continue working alone. All of these things collectively were discussed as he described his experience. These were the things that made him think about his work and the importance of safe work practices. These things became the foundation for his increase intent on learning safety through seeking others as mentors.

Another participant had a series of experiences that created for him the recognition of the importance of wearing safety glasses in required areas. James discussed the
importance of learning to wear safety glasses early in the interview and described this as a practice he was very conscientious to follow. He began describing his perception of wearing safety glasses by talking about training videos he had seen. He said, “I’ve seen those safety films where people got nailed in the eye and you don’t want anything like that to happen to you but that’s the reality that it can just by that one day you forget to put them on.” Since James was also partially involved in delivering formal safety training within this organization, it was understood that he had also seen a multitude of safety videos on other topics besides safety glasses. When the researcher questioned why wearing safety glasses in particular became important enough to incorporate into his practice, he mentioned that in addition to the videos that he had witnessed a series of incidents at a workplace in which his belief was crystallized. He described a positive experience of wearing safety glasses.

I’ve seen somebody get doused with sulfuric acid and it ate their clothes and everything up that they had on. He still has chemical burns on his arms where it hit him. There’s a couple of marks on his face. The one thing is he had on safety glasses. If he didn’t it would have really messed up his eyes. So, that was probably one of my earliest exposures to reinforce wearing safety glasses. I wasn’t physically there but I’ve seen what happened, I’ve seen the clothes and the shoes all eaten. To see something like that happen to a friend. I know that sticks out in my mind seeing the clothes all ate up…..the only safety thing he had on, was the safety glasses.

He then went on to describe a second incident in which he helped a person who was splashed with chemicals.

So she had to come down the stairs and when I heard a holler I came running in there, met her in the stairs, and she was hysterical. She said she got sprayed with caustic, it was all in her face and stuff. So I rushed her over to the showers. And then got under the showers and pulled the shower head so she started rinsing her face and eyes and stuff like that.
He proceeded to get her under the emergency shower. “And because I got her to the shower real quickly (she had) minimal damage.” He believed that this second experience dramatically increased his awareness and his learned response. It was the building of the second experience on the first that significantly strengthened the learning process for him. Finally, James talked about another incident in which this learned quick response of the emergency shower resulted in saving the eyesight of a co-worker and once again reinforced the understanding that James had developed.

Another guy got something in his eye. We were walking under some pipes. In my last job everything was chemicals. And I was walking underneath some pipes and he had a reaction. As soon as he looked up, whatever that chemical was just splashed and hit him right in the eye. I got him to the safety shower. I kept him there probably 20 minutes. I saw him the next day you could see the redness in his eyes but he was so grateful that I helped him and got him there and forced him to stay in there as long as I did. And even the doctor told him if we hadn’t of gotten right to the safety shower, the eye wash station, the damage could have been a lot more extensive. So, that’s one thing that always sticks out at me, the safety shower and the eyewash. It’s kind of an automatic reflex. Grab and go.

Although James’ initial response to the importance of wearing safety glasses was from watching a safety training video, of the many safety videos he had seen this particular one was most memorable because of his actual experiences. From these experiences James learned the importance of personal protective equipment (safety glasses) and the importance and ability to react quickly. In addition, as a result of the experiences, he developed the ability to instinctively know the location of all safety showers and eye washes in any given area. James discussed that when he is standing in the manufacturing area he knows at any given time his exact location in relation to the nearest emergency shower. In the researcher’s experience as a safety professional, this level of awareness while undoubtedly important is
probably very uncommon and while in the researcher’s opinion many employees perhaps
know the location of the shower or eyewash in their immediate work area, they are unlikely
to know where they are throughout the facility.

In addition, while James’ discussion of these stories began from the mention of
safety glasses it actually evolved into the proper use of the emergency shower. It became
evident from James’ experience that the conceptual grouping of safety related observances
and practices from a learning perspective was somewhat different than those generally
provided during formal safety training from a safety trainer’s perspective. For instance, the
learned value and behavior for James from these experiences was the importance of the use
of safety glasses and the location of the eyewashes and showers. This was in James’
perception a logically structured concept or schema. While certainly professional safety
training could be delivered with this content combination, in conducting a brief review of
training material regarding personal protective equipment including safety glasses, provided
by OSHA (U.S. Department of Labor, 1994, 1997, 2004) not a single source mentioned the
use of emergency showers or eyewashes. Safety professionals delivering training generally
discuss the use of emergency shower or eyewashes during emergency procedure or
emergency equipment training. Yet the personal protective equipment and emergency
equipment content combination was mentioned not just by James, but by a number of the
participants in the interviews indicating that this may be a commonly held concept
combination for learners.

When asked if he had this level of awareness before his experiences he stated,
“Not till the first person I’ve seen get hurt.” Although he knew of the importance of eye
protection from a video, it was through the series of experiences that this awareness reached a level of understanding and mastery where the proper response was learned and incorporated into his daily practice. Later James discussed how he informally passes this knowledge on to new employees during orientation since he believed this helps the employees understand the importance of safety showers and eye-washes.

Other participants described their first hand experiences where they developed a deeper appreciation for workplace safety as well. Renee had an experience where she learned about pressure vessel safety from co-workers. This was initially a negative experience that resulted in positive learning. She described an incident where a co-worker who was assigned to train her failed to properly tighten an apparatus on a pressure vessel. This resulted in an incident that Renee felt could have killed or seriously injured her. “That’s where it started. Somebody actually almost did me in.” She described the experience.

She didn’t close off a lock ring and she started it up. It was a sterilization cycle so of course there is more and more pressure as the heat goes up. “POP” I took off running and that thing went by me and hit the wall. That was when I went home and I said I don’t think I can work here. I had a hard time trusting the people that worked there after that. This co-worker she was supposed to be training me. I didn’t trust her.

In this situation Renee felt betrayed since she had trusted this co-worker who was supposed to be training her on the proper way to work with pressure vessels. Renee spoke in a way that indicated that this assigned trainer was practicing unsafe acts, which became clear early in the job and caused her considerable discomfort. After this experience she felt distrust for the trainer and although she recognized that the occurrence was not intentional, she felt this was not the person from whom she wanted to learn. She described how although this was
the assigned trainer, on her own she sought a mentor that would provide her with the safe learning opportunities that she needed. This pressure vessel safety became a true value and a starting point for Renee to learn more about pressure vessels. She then discussed how she selected an informal mentor and learned safer ways to work with pressure vessels.

In another interview Steven discussed a first hand experience where at a previous job a co-worker was injured by following a standing operating procedure (SOP). He stated, “We had an incident where one of my co-workers got splashed with caustic. The hose popped off.” He went on to explain the incident in more detail recalling how the employee had been very carefully following the SOP, which resulted in an injury. Apparently the SOP was incorrect and had never been changed. All the experienced employees in the area had known this, but because of the “red-tape” and effort involved in making the SOP change, no one bothered to take the time. The employee who was injured closed a valve according to the SOP when in fact it should have remained open. Steven stated, “the SOP had an error in it but everybody just knew that’s what it was but the two people working on it wanted to make sure they got that portion (of the SOP) correct. So they really went through the SOP really closely and correctly, but it had you closing the wrong valve and it caused back pressure and the hose blew.” When he heard about the injury he said, “My heart just dropped.” Steven discussed his personal feelings of responsibility since he had not told the co-worker about the error in the SOP. He also discussed how it became important for him to share information with co-workers if an accident could be prevented. He used this example as the basis for describing his responsibility and role as a mentor which is discussed later.
In another incident Lillian also had a negative experience that resulted in her seeking safety knowledge. “There was an instance where I was actually working on the bench with something but I had a co-worker on the same bench doing a different assay. He was working with a chemical and the fumes sort of floated my way and suddenly I was coughing and could barely catch my breath. And after trying to get over that, I went and got some air. I said what are you working with? And I read the label and it said that fumes can be fatal.” She was appalled that another employee could act with such disregard for co-workers. As a result of this incident she realized the importance and made it a point to become more familiar with the chemicals with which she worked. She also made it a point to make sure people she worked with understood how to properly use the chemicals in the laboratory. She felt because of her inadequate or lack of safety training she needed to obtain the correct information on her own and after having done so made it an effort to teach others.

These initial experiences with co-workers resulted in an increased awareness of the importance of workplace safety and provided a basis for the participants to seek more information and knowledge in workplace safety. In addition to experiences with other workers, many of the participants also described self-experiences that occurred that changed their belief in the importance of workplace safety prompting them to seek a greater understanding regarding safety.

5. Learning from first hand experience – living the experience
Personal experiences were another common source of learning the value of safety for the participants. These were learning affordances that the participant experienced him or herself. Sometimes the experiences described were incidents that were acute opportunities for learning. At other times the learning experience was just a general observation the participant made within their environment, or perhaps a general awareness that developed and evolved over a period of time.

Trent described a single dramatic incident in which he experienced and then learned the importance of general chemical awareness and understanding regarding material safety data sheet (MSDS). Material safety data sheets are used to provide product information such as health hazards, physical hazards, flammability, etc. and are required by law to be available for any chemical or product made. He described this experience in which he was unexpectedly exposed to a large quantity of pesticides while working on a farm that supplied eggs for pharmaceutical companies.

I was out in the chicken house giving inoculations to a bunch of hens and the pesticide sprayers came on while I was in there. That was a pretty horrifying. I ran out and went looking for the foreman of the farm and his response was, “well that stuff is not going to hurt you none.” That was his comment to me. They didn’t have MSDSs yet. I spent a couple of hours trying to figure out what the heck just got sprayed on me. As it turns out, it was something fairly benign. But that could have been anything. I could taste it. It was in my eyes. I didn’t have any sort of safety, “you are going to get sprayed.” I was in this long chicken house. You could see me running in my boots and this spray was getting all over the place. It was like a rain of pesticide coming down on me. I was not pleased.

As he described the situation it became apparent that it had been an upsetting experience personally. This was not merely someone describing the importance of chemical safety, but was a real life experience, rich in detail and emotion. Trent expressed that this
experience made him feel very angry. Yet while he was upset with being sprayed, he was more upset that no one at this facility was able to provide him with information regarding the chemical. He said the employer’s response, “Well, that stuff is not going to hurt you none,” was personally an unacceptable response to his exposure. He believed that he had the right to know what the chemical was and the possible effects of the pesticide exposure. The employee’s “right to know” is often taught in safety training sessions as a common name for OSHA’s Hazard Communication Standard. As the result of this exposure Trent learned that it was his personal responsibility to exercise that right and spent a good portion of the remainder of the day finding out about the chemical. At this facility he was provided with no safety training at all and consequently he had to seek information on his own. From this experience, knowing the details of chemicals that he worked with or around became important as a personal value to him on his job. Prior to this experience he had had training at other facilities but had not taken the training as seriously and did not typically read material safety data sheets. As a result of this incident and the consequent value of knowing chemical dangers, he made it a point to read MSDSs and understand chemical hazards at any place of employment.

Another participant had a similar exposure, but with the additional experience of having to use an emergency shower. Ryan discussed a work related experience in which he realized the value of chemical safety, specifically regarding caustics. He talks about how prior to the experience he had safety training, but it had not provided him with a true understanding or appreciation of a caustic exposure.

I’ve been trained on acid and caustic through the power plant. You know, we had chemistry classes in high school and you had to wear
your little safety glasses and did your testing. But I didn’t really know how bad caustic burn was until I got a fine mist of it sprayed on me. We had a pinhole leak in a fitting, and didn’t know it. We were doing regens (testing) and I was walking back there to check the gauge. I walked out. I had my safety glasses on, had earplugs on because it was loud in there, but I had just my regular cotton T-shirt on and got a fine mist of something on me. I didn’t know what it was and it didn’t smell like anything, but man, within 2 or 3 minutes I was on fire. Emergency shower - that was a rude awakening, cause it was ice cold.

In this researcher’s experience safety training pertaining to safe handling of acids and bases (caustics) typically addresses the danger of skin exposure. This training might include some discussion of the availability and use of an emergency shower and eyewash, which is required under the OSHA Standard. In the researcher’s experience, participants receiving this type of training probably don’t realize or even consider the discomfort associated with the experience of actually standing under the emergency shower, they just know that this is the correct action to take in case of exposure. Through his personal experience Ryan became acutely aware of the danger of a caustic burn and with it, the misery of standing in a cold emergency shower without privacy for 15 minutes. After the physical pain of the burn, followed by the cold shower involved in this experience Ryan learned the importance of knowing chemical safety and associated hazards. Ryan made it a point to understand the hazards associated with chemicals with which he worked.

In another incident Greg described a personal experience through which he became convinced of the importance of wearing a hard hat.

I hate hard hats. But like an idiot they had these air hoses. So I thought the pressure was off this hose but there was no way to verify it. So I reached over there and snapped that thing real quick. And that hose came up and center punched that hard hat. From there on I have been
thankful for hard hats.

Greg perceived the cause of the incident to be his own fault when he stated he disconnected the hose, “like an idiot.” This was one of the only experiences throughout the interviews where a participant openly recognized and stated that their own behavior was in some way the root cause of the incident. Greg saw himself to be at fault since he believed he should have verified the air hose pressure had been shut off. While wearing a hard hat was something that he had done with varying degrees of commitment prior to his being hit with a flying air hose, his actual appreciation and learning the importance of wearing this protective equipment did not occur until after the experience. While Greg became more cautious with the use of air hoses he also stated from that point forward he always wore a hard hat in required areas, without question.

Some of the experiences that were discussed by participants were not as traumatic and the understanding developed from a more general awareness. Renee developed an appreciation for the importance of basic biological safety and as a result incorporated basic biological safety practices into her life. This learning situation, like many of the practices discussed during the interviews, applied to both home (non-work) and work. Renee’s learning came from an experiment she conducted on her own during free time while she was in new employee orientation for a new job. In order to become familiar with the lab equipment with which she was expected to work, she took wipe samples of various items in the workplace so the samples could be tested using the equipment. Wipe samples generally consist of rubbing a swab on a surface then rubbing the same swab on an auger plate. An auger plate, also called a petri dish, is a small round plastic dish used to grow bacteria
cultures. The plates are placed in an incubator and the bacteria cultures are allowed to grow so that the bacteria can be identified. The equipment with which she was going to work included the auger plates, incubator and sample testing equipment. Her experiments were an opportunity to learn how to work with these items. She talked about her experience.

Renee: The things that I have learned from work sometimes I make sure at home that I do. Like one of the things that I used to work with was bacteria in fermentation. I think I’m pretty conscientious of germs. I swabbed the toilet, the telephone, and the doorknob. Then I put them on a plate. The phone was just the nastiest one of all of them. It was really, really bad because of all the skin cells from various people. Thinking that you are touching after watching people that aren’t (careful) picking up pens and writing and putting them down. You come and pick them up and they have been working with bacteria. I got very aware that it doesn’t matter where you are that even if you are outside of that area you can pick something up.

Researcher: And you got all this through the swabs?

Renee: It was the very first thing I did when I went in there. I was training. I had a little time on my hands. So I just did that and I thought wow, “that’s pretty amazing.” I had the plates and just getting into the actual work, dealing with the bacteria and watching the people who weren’t really conscious about keeping themselves clean. We work with strep. and different organisms. We scrub up and make sure we use alcohol. That stuff (bacteria) is potent and it proliferates. Some of it is dangerous and some of it is not. I had never worked with anything like that before since this was right out of college. So it really made me mindful where I wasn’t before. At home, cooking keeping myself away from the chicken and you know touching other things. I wash my hands when I go into the restroom and I wash them when I leave and that’s a habit that I didn’t have prior to working in fermentation and cell culture.

Researcher: Was it that swabbing experience or were you taught this?

Renee: The swabbing experience really drove it home for me that it is germy where you are. You don’t have to be in a lab. You can be at
home. You touch something and don’t wash your hands and you remember rubbing your eye and next week you’ve got a terrible cold or fever and you are sick and you think back “oh my goodness – why did I do that. I think that those types of things really make it real. Seeing some of those things under the microscope like the e-coli racing around. That really made me say I am going to wash my hands when I come out of here no matter what. That is an easy incorporation. As soon as you see that or think that – you do it. Once I realized how bad it was, I just did it.

This experience for her was set within the environment of performing the work with the equipment she would be using. It provided her with the context based learning opportunity for her to develop an appreciation for biological safety. While she had prior training regarding biological safety, this became her opportunity for actually learning it and incorporating it into her regular work practice. As she described her perception, it was clear that this was not pictures of bacteria colonies or prepared slides in a college class, but instead the actual bacteria that was growing on her telephone. This was real. Also, like a number of the participants, in her mind the line between safe practices at work and safe practices at home was indistinguishable. This learning opportunity allowed the concepts to cross into her home life with great ease. Properly disinfecting the lab bench at work after testing a sample was conceptually no different to Renee than properly disinfecting the kitchen counter after cutting chicken.

Other participants had self-experienced safety learning situations that came about through even more of a gradual awareness. Often these were personal insights of the participants. They described them as realizations that occurred such as when Trent became aware of the importance of washing his hands through observation and awareness of his own health over a period of time. He said, “I think I am learning when you get sick a couple of
times extra in a year and you begin to think, “I wonder if there is any correlation between my
not washing my hands.” As a result of this insight he began incorporating better hand
washing techniques when working in the lab. This concern for personal hygiene was
reinforced with his recognition and reflection on the biological lab samples with which he
was working. This for Trent was the same type of realism that Renee experienced. “Once
you break it down to a more you and the (laboratory) sample kind of level it becomes very
real and you start to incorporate a lot of different techniques into your work.”

A number of the participants reported a self-image they had developed that indicated
they were unwilling to take risks. This provided a foundation on which they built their
perception of workplace safety. For instance Mary had developed a very general attitude
regarding safety. She saw herself in a way she described as a “non-risk taker” and used the
term “fearful” to describe her work practices regarding safety. Throughout our discussion
she talked about risk-takers and the impact they had on her perception of safety. Through her
observation of co-workers she saw their risk taking behavior as dangerous and having the
potential to result in injury as well as disciplinary action. As a result she chose to incorporate
the safe behaviors that were generally held to be important. For instance, we spent some
time discussing a previous job in which other people occasionally reached inside a press to
clean blocks. This particular hazard is written in OSHA’s Control of Hazardous Energy
Standard and includes a mandatory training requirement. Employees at her previous place of
employment had been trained in the safe use of this equipment, but apparently did not follow
the procedures. Under the procedures reaching into equipment of this nature was supposed to
only be done with the equipment stopped and metal support beams inserted in the press.
While all employees stopped the press, many did not insert the beams. She perceived this to be risky behavior.

Researcher: Why do you think those people took those risks?

Mary: Cutting corners. Saving time. Not that it really took a whole lot of time but the metal beams that you stick in between the blocks they’re kind of heavy. So you know, not picking up the extra weight and putting it in there you know. So, they just figure, hey why stick it in there? And it only took a few seconds to clean the blocks off because you just take a cloth with alcohol and just sprayed it down and wiped, you know.

Researcher: How did you decide that you were going to use it? And you saw people do it both ways?

Mary: I am looking out for me. I’m not a risk taker. I’m fearful of different things you know.

This self-image of being fearful was something Mary had developed outside, but carried into the workplace where it provided a basis for her safe work practices. Later she described how this self-image as well as her perception of risk takers came from her upbringing.

In general, experiences made safety an intrinsic value that the participants used as a starting point for learning. Many of these foundations for learning workplace safety resulted in experiences that participants had either by witnessing the incident, or by experiencing the incident themselves. A number of participants had also developed a general self-perception that afforded them opportunities to perform their jobs taking little risk and learning by watching people who did take risks. The participants readily shared these stories with the researcher without hesitation, once they discussed learning and not just formal training. They
described these experiences as the foundation for the importance of and for acquiring further knowledge of workplace safety. Participants also indicated that they readily shared safety information with other workers and the use of their stories was seen as a powerful tool when used for teaching both informally and formally. These points will be addressed again in greater detail later in this paper. Often learning opportunities had been provided in formal safety training but did not necessarily become a part of the participant’s repertoire of safe behaviors until the experience. In many cases these safe practices were shared with co-workers either directly (through discussion) or indirectly through modeling as discussed later.

*Mentors and Leaders*

The concept of leadership was discussed throughout the interviews. It was discussed as it related to both formal leadership, such as a supervisor or trainer, as well as informal leadership such as a self-selected mentor. Occasionally the mentor and the supervisor were the same, but just as likely they were not. A number of the participants discussed how having the formal title of supervisor or trainer did not necessarily mean that the person possessed leadership qualities regarding workplace safety. Renee was very clear about this from a work situation at another facility. She stated, “There wasn’t any formal safety training or anything. I learned from my manager who was very, very, smart scientifically but got a little bit sloppy at times.” As she discussed this in terms of safety she mentioned that there were other co-workers who provided the safety information she felt she needed. Mary also talked about this with one of her managers. She felt he was not being a
good role model for safety by stating, “he was a good supervisor but he was a risk-taker.” She used this term “risk taker” often in her interview when describing those she believed were not safe in their behaviors.

Other participants spoke of their managers in a positive light regarding workplace safety. Ryan talked about one construction job he had and his supervisor. “We worked for him all the time. He was a good guy and he was a safe contractor.” Steven also described his supervisor as a role model and excellent teacher regarding workplace safety.

Despite the designated title, the participants’ safety learning seemed to be more closely tied with someone they self-selected such as a mentor or someone with informal leadership qualities rather than the designated formal leader. Many of the participants saw themselves in turn being the mentor or leader for others. Their role as leader, be it formal or informal, empowered them with a sense of responsibility for the safety of those employees for which they mentored.

Quality and Safety

When selecting and describing mentors for safe work practices the participants related this closely to describing those who also exhibited the ability to work in a way that represented high quality as well. The participants discussed their ability to informally learn and almost intuitively identify these mentors in the workplace. This “learning from whom to learn” became an important skill for the participants. Often this learning occurred through observing others work within the workplace. A number of participants were unable to differentiate those mentors who worked in a very safe manner from those who worked in a manner that exemplified quality work. Renee saw this when she described her previous
manager as “a little sloppy sometimes.” As Kyle stated, “I think they go hand in hand – quality and safety – I mean if you are doing it safe there should be quality. I would think it would be hard to be doing something dangerously and it have very much quality to it.”

When asked if he could identify the co-workers that were good role models Kyle said he could. The researcher asked how he could tell, “Overall attitude, you could just tell that they were doing it for the right reasons and they cared about what they were doing.” Andy discussed a similar perspective on identifying and selecting the co-workers who were good role models. He also saw safety and quality as related attributes. He discussed the co-workers at a restaurant where he was previously employed, “There were a couple of servers there who had incorporated these sort of things into their repertoire.” When asked how he could identify them he commented on one particular server that he used as a role model, “You respected his way of doing things. You have to admire something when it’s done well. Like Michael Jordan shooting a 3-pointer or this friend of mine sitting down the sizzling hot fajita.” As Andy talked about this he said, “I think the thing that stuck with me is you can really learn a lot from watching other people’s form.’

Thomas had an experience that opened his eyes in identifying those who were conscientious about the way they worked. He talked about “horseplay” at a previous job and saw that as people not taking their jobs seriously regarding workplace safety and quality. This value became paramount for him when his mother was diagnosed with cancer, and she was receiving intravenous medication that was manufactured at his facility.

Thomas: In ’93 when she was diagnosed and she passed away in ’96, I always did what I was told and always followed the right path and trusted my management team to the fullest. After my mom passed away
or after she got sick, I did a whole lot more questioning. I had learned what was right and what was wrong. I started to grow up myself and I could see things differently. I questioned my management team a lot from the sickness that my mom had. She was getting (drug xx). It was made at my company. It is a product to boost your immune system so I (my mother) was also a user. You know this was my mom so it was a big issue. I looked at it and said we made it and I was involved in it and I started saying, “wait a minute, this could be better. The quality could be better.” I think that had a lot to do with me leaving. I think to go back again if it was your mom or somebody else’s mom that was sick, you would not like some of the things that were being done.

Researcher: You think prior to that it wouldn’t have had the same effect on you?

Thomas: I think prior to that I don’t know. If I wasn’t immediately affected by it would it affect me as much? Probably not. Since it was so personal and so close to me that whenever you see something that you feel could be done better. Maybe before you keep quiet maybe you want to say something. That event did carry a very powerful message towards my wanting to do a good job. Seeing that there are actual real people that take our drugs and you want them to be the best. You just try and do the best you can.

This connection between the work that he performed and its relation to his mother dying played an important role in Thomas’s appreciation for quality as well as safety in general. The employees he saw taking the short cuts with safety were the same ones taking the shortcuts with quality. This provided him with a level of understanding that allowed him to make decisions regarding selecting those he wanted to use for learning. The learning of safe work practices was closely related to learning how to perform a job from a quality perspective, and the participants recognized this.

6. Selecting a Mentor – “you can really learn a lot from watching other people’s form”
Kyle generally found that learning from other people was important, once their credibility had been established. He had a situation where someone told him a certain way to perform a process. He didn’t listen and proceeded to do it his own way. As a result he was splashed with a chemical, which fortunately did not result in an injury. From then on he listened to this particular person. When asked if this person had established that credibility he said, “Oh yeah. That’s what it takes sometimes. It takes it to happen to you. I mean, sometimes I hear people say things and sometimes you think they are crazy. It might not sound right to you but if something happens to you, you may end up saying, ‘well you know, I understand now’.”

The researcher asked if there were other people he could learn from and he responded, “Yeah, there were people I kind of looked up to. They knew what they were doing and had been doing it for a while and I kind of looked up to them.” The researcher then asked how he could identify these people.

Just by watching them. You can tell a lot about a person by watching them. You see someone and they know what they are doing and you’ll never see anything really happen to them. Everything is usually running real smooth with them. They are not getting into accidents and the process runs real smooth when they are running it. That’s a good sign to know they are someone who will teach you a lot and help you out.

He said he could spot these people, “Oh yeah you can see. Kind of pick up on the things that always run good around that person and they know what they are doing and they are watching what they are doing and not really taking it lightly. As opposed to, I wouldn’t follow someone who is always getting hurt.”

Renee’s experience with the sudden discharge from a pressure vessel that was assembled in an unsafe manner prompted a similar situation where, “I found the mentor,” and
how she found co-workers she trusted or as she stated, “the people who took me under their wing.” She went on to describe how she observed and then selected the person whose work style she most sought, “I mean just in watching him. I said to myself, ‘I am just going to hang out with Jonah.’”

Andy talked about his ability to identify mentors for quality as well as safety. He discussed how you could tell a great deal by watching someone’s form. He went on to discuss how this type of learning through modeling takes place in the lab all the time where a good or safe work practice is witnessed and incorporated into one’s repertoire. He described a way of opening test tubes with serum samples that minimized contamination.

It’s hard because safety is one of those things when you’re learning a technique in the lab it’s not one of those things that the trainer will emphasize necessarily. It may not be a conscious thing all the time, but like I said if you’re watching you see how they handle it. One example is a technique that I picked up from watching somebody else was taking chem-wipes and folding them up and using them to open sample tubes that has human serum in it. I saw somebody else doing it and thought that’s a pretty good idea. You know, the first time you see it, someone opens one up and there’s a human sample and it’s got a nice reddish color to it, you take the chem-wipe up and sit it down on the bench and you see all the red. You’re around that too and say to yourself that can be either on my hands or on the bench top or in the air, why not put a wipe over it and do that. So that was something that was easy to incorporate and just became a way of life, a way of work.

By observing others work he selected co-workers whose style and practices were ones that he could model his work after.

Trent described these qualitative attributes of mastery in a way analogous to the tacit knowledge described by Tennant and Pogson (1995, p. 57). In the description of expert performance they state, “we do not remember a set of facial muscle positions, but we know
(tacitly) what emotion they express.” Trent talked about mastery as an exhibited way in which one works. He talked about the man on the chicken farm that was the master and this mastery was a skill set that included being able to perform a task skillfully and safely. He later described how this mastery skill set might be viewed in the process of pipetting samples in the laboratory.

It is not written down anywhere. It is not taught anywhere. It is just sort of, you get better with experience and learning from those that are better than you. In that example (pipetting) there are a hundred different ways to do it and one person will tell you this is the best way and another will tell you that is the best and I don’t know that there is really a good example. Like I said with the liquid handling and the pipetting where the physics of it matter or the mechanics of it matter. Someone will say, “I break up the cell 30 times” or “I break them up 40 times” Well they look exactly the same, they seem a little happier. You hear that all the time, the cells are happier well how do you qualify that – happier? Well the counts are a little better, well that’s true I guess they were happier. Well how did you know that? Well I could tell by looking at them. I could tell by pipetting them. I could tell by the feel. All sorts of crazy stuff like that.

As Trent described how he could identify this mastery style he struggled with the words to explain it, although it was clear what he was trying to explain. This again is a qualitative tacit knowledge that seemed clear to Trent, but as Polanyi states, “We know more than we can tell” (as cited in Tennant and Pogson, 1995, p. 58).

Almost as important, a number of participants were fairly confident in their ability to identify those co-workers who they knew not to use as role models. Lillian mentioned this with the experience she had when the co-worker opened the vial of toxic chemical beside her on the lab bench. When asked later in the interview if she could identify role models, she
responded, “The guy who had the fatal chemical out on the bench, I knew not to model myself after him.”

During his interview, Kyle discussed his concept of quality and how it related closely to workplace safety. He talked about co-workers in general that were not good role models and described them as almost deceitful. He talked about how they might “hook you”. In the interview he felt he could easily recognize these poor role models and gave an example.

I think you can tell pretty easy. I can identify the people I don’t want to hang out with on the floors or whatever, that I don’t want to try to learn anything from. They just seem tricky and they seem like they would hook you, you know what I mean? Then you see those people that want you to do it the right way and looks like they are thinking if you do it the right way they teach you something. You definitely can tell who you want to follow and who you don’t want to follow.

He provided an example where a co-worker suggested that he insert his finger into a hole of a bioreactor to feel the agitator spinning. The normal method of testing this was to insert a laser into the hole and observe the light through a sight glass in the bioreactor. Although he could not argue that the “finger in the hole” method was necessarily risky, to Kyle the practice made him uncomfortable. He used this example when referring to those people who would “hook you.” He stated, “They will tell you. ‘just stick your finger in the hole right there and you can feel it moving around in there.’ I am not sticking my finger in that thing. That kind of people I try to stay away from. Definitely – I don’t want to take my finger and put it in there and risk losing one of them.”

In a previous job Kyle described a different incident that provided another example of learning who not to select as a mentor. “I learned one time from seeing a guy bust all his
knuckles up on a piece of metal.” He described the incident where the co-worker was demonstrating how to fit a chimney cap on a chimney. The co-worker was trying to get the cap to fit by hitting it with a hammer. “He is over there wailing away on it trying to get a little bit beat in there and he is teaching me how and I’ve been there two days and he misses that thing one time and hits it and that real thin sheet metal and comes across and it and he just frails all his knuckles.” As a result he said, “That one guy – I definitely didn’t want to learn from.”

Lillian also talked about her being able to identify employees who were very conscientious in the way they approached their work and those that were not. She attempted to describe these attributes, and as she discussed this she symbolically referred to those that were conscientious as being on the “good side” and those who were not conscientious as being on the “dark side.” Like other participants she saw safety and quality as sharing the same characteristics. She went on to describe her perception in greater detail.

You had the good ethical people who followed the guidelines and you had people who scoffed and wanted to be rebels. We would have new people come in and they could choose to go either way and my personal goal was to make sure they went the right way. I never made enemies; I was well respected even by the rebels. They knew “Vivian’s trying to teach right; don’t listen to me, listen to her.” That’s why I enjoyed it because at least I had that opportunity to lay the groundwork. Where they choose to go from that point on, that was their choice but at least they’ve had it. And I would remind them, “What kind of person would you want running your lab test? People over there making jokes, dancing and singing while they’re doing their work, or the people who are really concentrating on what they have in their hand?” So you know, I saw all of this and I did see where a lot of people were pulled to the dark side. It was easier and more fun over there. We were more serious about what we were doing.
While Ryan had recognized and discussed those he wished to be like, he also talked about the employee whose death he had witnessed and described him as being on the other end of the spectrum. He discussed that while he and the deceased employee were not personally close, this was someone with whom he had gotten to know and worked with for about six months. He explained that this employee was relatively new to this workplace and did not tend to be real focused or mindful on his work. He had mentioned that the employee required a great deal of “babysitting”, often took too many breaks and would, “always put his hands on something, turn switches and knobs and see what was going on. You would always say – wait a minute – you can’t do that – this is a plant.” Later Ryan talked about the mentors he chose to follow.

In general most of the participants believed that they could select the co-workers from which they chose to learn. This process of selecting a master occurred informally and intuitively, and often was a person other than the one designated as the leader or supervisor. Just as importantly participants could identify those employees from whom they chose not to learn.

7. Learning from a Mentor – “I’d work with him today, any day. He was the best I ever worked with”

While participants described those co-workers who they wanted to use as role models there was also discussion on how they learned from these mentors. Though what they learned was often difficult to separate from the description of what made them a good mentor. In other words, the participants often viewed the attributes of quality, safety and
mastery as embodying the same characteristics. Modeling was commonly used as a way to learn from mentors. Ryan talked about the operators that fulfilled both the formal leadership and informal mentoring role at a power generating facility and how he decided that these were the people whose style he most wished to emulate and how he learned their style. Ryan talked about his perception regarding their style.

Operating style is one thing I learned from what I call the big three guys. There were three guys who were really, really good….in the power plant that I learned from. They’re never strict, they just showed you the proper way to do it and it wasn’t never implied this is the safest way to do it. This is the way it should be done. You knew those guys knew what they were doing and they showed you.

Ryan spoke of these leaders with the highest regards. One leader in particular had a style that Ryan believed was very practical. He modeled his own style after this mentor. As he learned it he also used it to teach others. He explained how this workplace master passed on his skills which were very similar to the methods of workplace mastery that include modeling, scaffolding, coaching and fading process described by Billett (2001).

“I’ll show you how to do it one time. I’ll help you do it the second time. The third time you’re going to do it in front of me. The fourth time you’re on your own. You better listen to me, you better listen straight, you better learn it now.” That’s how they trained me and that’s how I train guys below me and it just worked out that way. You want them to kind of take the assertion and take charge and just help you do your job. He was real calm, real cool. I’d work with him today, any day. He was the best one I ever worked with.

Ryan talked about how he used some of these learned leadership techniques to keep his employees safe when he was an operator. He mentioned a power plant in which he worked where he believed the management was creating an unsafe environment by running
boilers at 110% capacity. He felt it was his responsibility to his employees to make the work as safe as possible given the situation.

I learned from other operators how to operate and get your guys (safe). Move your guys around at night from certain areas that were dangerous. If you are having to push the boiler limits, you have been told to do it by management. You tell them (your employees), “hey, stay out of the boilers. Stay out of the front of the boilers. Work around them, don’t go in front of them. Don’t stand in front of them. Don’t stand there smoking a cigarette. Stay in the break room. Stay away.” And they know. It’s like, hey, they’re trying to crank megawatts out tonight so let’s be careful.

He used the mastery technique he had learned and applied it to a situation where he had responsibility in dealing with conflicting information. On one hand he was being asked by his management to create an unsafe situation, while on the other hand he felt a responsibility for the safety of those reporting to him. Tennnant and Pogson (1995) describe this ability to cope with limited or conflicting information as a characteristic of adult intelligence (p. 31) and Ryan seemed to view it as such also. He talked about this in a way that reflected his pride in his ability to handle this situation. In his mind, this was where his mastery came into play.

Ryan also discussed how one of his supervisors was working in the control room the night the co-worker fell to his death in the steam pit. He implied that while the death was not the fault of the supervisor, there was a sense of responsibility that the supervisor felt. He discussed while most of the crewmembers were sent home that night, there was no one to relieve the supervisor. As a result his supervisor had to remain in the control room for the remainder of the night. He stated, “he felt bad, he really felt bad. It tore him up, and they didn’t have a relief for him so he had to stay there all night by himself at the plant just to sit
there and think about it. I thought man….” Ryan empathized with the supervisor’s predicament, which provided Ryan with a deeper sense of responsibility as a leader and making sure his co-workers were safe.

Similarly, following Trent’s experience of being saturated with a pesticide in a chicken barn he sought a mentor that could provide him with sound guidance regarding that particular workplace. Trent’s description again exemplified a work style that combined safety, quality and mastery. Trent described his mentor by saying, “it was very clear that everybody looked up to this person and that he was certainly a keeper of knowledge and he was someone I could come to. He was there and he was sort of the guy that could get stuff done. He was sort of the guy that the boss would say, ‘kind of guide them through.’ He would set about telling me his way. It was just sort of never anything written down he had the knowledge. He would just say, ‘Now what you need to do is….’”

Trent discussed how important his mentor’s role was in providing the needed safety information since there was no formal training. “I think that was why he was there. I think they knew they needed someone who knew the old way.” Trent’s statement exemplified his concept of mastery and how it related to his present job. He said, “Maybe that’s it, you know before the SOPs, there was just some guy who knew everything.” Trent talked about how this mentor role continues in the present workplace in a similar but unofficial capacity. He described how the keeper of the knowledge that was sought by others still existed; however, the role may be shared by a number of co-workers within the department. “We all gravitate to the person who has the best performance record or maybe
went to a conference and comes back with something new.” He discussed how through observation and modeling he would pick up new skills.

Lillian also discussed her relationship with a co-worker for whom she had great respect. She talked about how even within the formal training setting they shared information. “I sort of hooked up with him at work pretty early on through all that training, and we even talked about training, as far as what to be on the lookout for because some of us saw ourselves as safety officers within our departments.” She described him as a mentor and role model and admired the way he worked, “Yes, he is one of those people who follow something to the letter.” When asked how she could identify those who would be a good role model she stated, “When you’ve seen someone just take extra, extra, extra care, time and time again, always, would never run (operate) without taking this precaution, you gain a high level of respect for them. That’s the person who you want working on your specimens, your own, your family’s.”

Renee discussed how she picked a mentor after whom she decided to model her behavior. Like others she used her skills in selecting a mentor both inside and outside the workplace. She talked about how she used this when she learned to race bicycles and when she played in a band. She would pick a master in these areas and try to perform exactly the way they did it. Once she had the technique down, she would then take the liberty to experiment with variations and improvise. She said, “That was how I learned. I would do it the way they did it and then I would feel comfortable to make changes. Like okay, it sounds better this way or this is better this way. For the most part it was like just doing it the way it
was done. If the results were the best, I think well they have great results.” This was the way she learned her music and the way she learned technique in her workplace.

While the participants struggled with trying to describe how they selected a safety mentor and what the characteristics were, most all of them knew intuitively the process and the characteristics.

8. Being a Mentor - how I’m really supposed to act

Most of the participants also saw themselves as playing the role of mentor to others and discussed how this role encouraged them to develop and practice their own safe behaviors. These participants saw themselves as informal and sometimes formal leaders, and as such felt they had a responsibility for the safety of others. Often times this was an implied responsibility and not part of a formal job description.

After witnessing the death of a co-worker Ryan stated, “I came back to work and from then on I was on every safety team that we had at the plant and led safety stuff because the guys would listen to me because I would tell them straight up, “I have seen it and you don’t want to be a part of it.” He went on to state, “it’s better to set an example than to be the example – that’s the way I always looked at it. You don’t want to be the one that everybody says, ‘Man you should have been wearing that because…” Later after he became an operator at the plant he discussed his feelings in relation to his subordinates. “You felt more responsible for those guys because they were younger than you and they looked up to you and you didn’t want to see them get hurt.” Through his experiences he felt an increased level
of safety awareness and made it a point to share his understanding with co-workers whenever he had an opportunity.

Since James’ experience assisting others in using the eyewashes and showers stations following chemical splashes, he has had a number of jobs in which he was a supervisor and made it a point to teach any employee working with him the location of eyewashes and emergency showers. Since these experiences he believed this was his responsibility. He stated, “I’ve always been in the lead position so I always try to protect whoever’s either working with me or reporting to me.”

Similarly after hearing of the employee that was injured when she followed the correct SOP, Steven felt responsible to pass his learning experiences onto other employees through mentoring. He said, “I think sometimes what makes me really safety conscious is when I’m responsible for the people that I’m working with.” He talked about this responsibility and its origin. Ever since he could remember he recalls getting very upset when someone was injured. He described this as far beyond most people’s concerns. He talked about having these feelings as a child when one of his siblings was hurt and these feelings have been carried into adulthood. He stated on a number of occasions, “I can’t stand to see the pain and suffering.” He stated that incorrect SOPs are not uncommon and can create a dilemma for the employees, “the bad thing is, that gray area of the things you don’t learn in class. Because you train on the SOP in class but you go out there then find those problems.” He felt responsible to the other employee because he had failed to “re-teach” her the correct way. This informal remedial training after the conventional training was common according to this participant. He also implied that this type of problem was just taken for
granted in the workplace. He stated, “That particular situation (SOP) I think may have just been something that I was working on one day and I ran across myself. And you know, like everybody else, I didn’t do a thing about (changing) it.”

Since Steven’s experience with the incorrect SOP he took more initiative in making sure the new employees received the correct information after the formal training had been completed. “I always try to make it a point when I’m training and going through the SOP. I’ll stop and I’ll say, “Well this part in the SOP…, you’re not supposed to do this, this, and that. It’s not in the SOP it’s just one of things you kind of have to know.”

Like Ryan’s situation where management created an unsafe condition with the boilers, Steven also saw mentoring as his ability to intervene to protect co-workers when the formal system was in error. This is what his mentors did and he saw this as what made a person good in performing their job.

Lillian talked about her beliefs regarding responsibility as a role model. As with much of her interview, a great deal of her value regarding safety was founded on the importance of her family and children. In regards to a previous job she stated, “I always wanted to feel when I worked there that someone would want me to run tests on their children or their family.” She believed that her ability as a role model and a master was reflected by responses from other co-workers. She talked about getting, “thank you letters after people had left the company saying this was my first work experience and you taught me how I’m really supposed to act.”

The participants discussed the development of mastery regarding safety as well as quality as a learning process where a mentor was informally and intuitively identified. The
skills of the mentor were then modeled as mastery of the subject was developed. These skills and knowledge were also passed along to other employees. This movement of knowledge occurred vertically through the community of practice from a central to a more peripheral level of participation. At the same time safety knowledge was passed horizontally between employees within the group as discussed in the following section.

9. Learning From Others Within The Community Of Practice – Sharing Best Practices

Some of the participants discussed the concept of learning from co-workers in their work area and situated learning on the job. This process was described as an informal sharing of information and knowledge and was quite commonplace, though apparently something that was not commonly articulated or recognized since it was usually discussed late in the interview. Each participant that described this phenomena used different terms, which also indicate it was something they knew, but not necessarily something that was commonly discussed.

This form of shared knowledge was described as readily available throughout many of the workplaces. After having a negative experience with pressure vessels Renee sought co-workers who could help her understand their safe use. She said she found people who “took me under their wing. They’d say, ‘come over here I’ll show you the ropes.’ Which was really helpful. Co-workers showed her how to insert and properly tighten gaskets to prevent sudden release of pressure. She said, “They taught me how to be safe.”
Steven discussed how a great deal of his workplace safety knowledge was learned from other workers through everyday conversations. He stated he learned, “From different co-workers that say, “Hey, you know, this is the deal with this equipment.” When the researcher asked if he could provide a specific example, Steven described an incident that occurred at a previous construction job. “One of the guys was talking about how he had got shot with a nail gun.” He went on to describe his story in detail and how through the story he learned the importance of how to use the gun in a safe manner. The use of stories based on experiences was again a repeated theme and often seen as a good tool for learning. He stated, “Whether it’s a good story or not once the story stands out, you know, I think that’s what a lot of times has the most impact on you.”

At this particular job Steven stated that most, if not all of his knowledge regarding workplace safety came from the co-workers. He said, “There was really no classroom at all and if there was it wasn’t significant. It was all on the job….talking to the people that I’ve worked with.” It was an informal process through which information was shared and he developed his understanding of safe work practices. “It’s just learning from the stories that the other boys were talking about. Sitting around at lunchtime and you know, “Hey, so and so did this and that.” that kind of thing. You’d sit there and you think, ‘Man, I didn’t even think about that.’ And so you make a mental note, ‘Hey, next time I need to be aware of this or that.”

Later in the interview Steven discussed how even now, when formal safety training is provided, other people outside the training provide the details of the workplace safety. He talked about a time where he had a class on chemical safety, but when he began work,
another employee provided more specific safety information that had not been provided in class. This information included the particular dangers of a chemical that was not discussed at all in class. He had learned that this information could be very valuable. He said, “I perk up when they (co-workers) have been working with it five years or so they say, ‘it’s bad news.’ I’m going to listen to them.”

Steven recognized on the job an informal nature was the primary way in which his learning took place. He gave an example as he discussed how learning about pressure vessels was dependent upon those that know them and how to properly use them. “I mean there is no class for pressure testing and the different stuff you’re doing. Most of our stuff now is on the job stuff so if you don’t get it from the right person or the right amount of information then you could really injure yourself.” Later in the interview he revisits this concept.

I think most everything I have learned, especially about safety, whether it be here or anywhere else, has been from other people. The things were, I mean most of them were learned from other people. Being here I had the most classes as far as safety. Most classes here, and everywhere else has just been where you can pick it up from. And so it is learned from my co-workers and stuff. There was never a class.

Steven said most of the chemical training he did receive in formal training was incomplete. He said the trainer often advised students to read the Material Safety Data Sheet, which he believed was not really helpful. “They tell you to make sure you know about and read the MSDS on the chemical you work with and stuff like that. If you took a poll here or anywhere else about how many people have read the sheet on each chemical they work with, probably not 25% of them have. And most of them have found out from their experiences and stories.”
He talked about the use of a chemical that while the hazards were discussed in class, they were not fully explained.

There was a general class on chemicals. You go back to the MSDS book and look it up. We have tri-pan blue which is toxic. When I first started that was one of the first things that they (co-workers) told me when we went in there, “Hey, don’t get this on your skin” and that type of thing. I mean at first we went in the lab and we were actually mixing some up and that’s when they said, “Hey, this is toxic.”

Lillian recognized that everyone had different skills in which they could become role models and believed this sharing was important. This task was not limited to formal leaders. Mentoring became a shared responsibility in her present job. She explained, “So okay I’m assay leader for this particular assay so I’ll train this person on this assay. Or we have some really good computer people.” She described how people distributed this knowledge in the group through informal communications. The different skills needed were learned from employees in other areas who had that expertise.

Trent talked about the safety representatives in his group who acted as an informal mentor. He described his perception by saying, “You see people who do things that you will just watch them and say “oh look they washed their hands again – that makes sense.” This process of watching others and modeling as a way to learn safe practices was commonly described.

Trent also discussed how prevalent this type of community learning was at companies where he worked and discussed that this process was very important for him on the farm. “Just learning, I had never worked with birds before and the roosters were really aggressive. Just word of mouth, there were no SOPs.” Most of his learning in that
environment was through the general community. He said, “They were just farm folks that had learned through bad experiences cause they certainly weren’t trained. They were just learning the hard way. They were giving me the knowledge that they had learned so I wouldn’t have to go through the same and I was very happy that they did that.”

10. A Learning Community – “We are all very much tied to each other”

A number of the participants presently work together in the same department. Although the researcher did not share information between participants, they all described an environment where knowledge was shared within the department. The concept was very similar to what is described as a learning organization (Marsick, Bitterman, van der Veen, 2000; Wenger, 1998; Koffman and Senge, 1995; Garvin, 1993). The members of this community of practice discussed group learning as playing a vital role in the success of the department. Their manager was not only supportive but encouraged this type of learning. The participants individually discussed how beneficial this shared learning was and how it contributed to the betterment of the group in total as well as to the individuals.

Trent discussed how the information that he believed was needed regarding safety, quality and the work in general was openly talked about within their department. Regarding this knowledge Trent stated, “You try to give it out. The better we all do, the better my co-workers do, the better I do. We are very much tied to each other.” He saw this sharing as vital to the success of the department as a whole. “Like I said, I am relying on you and you
are relying on me and we both better be doing the best job we can or we are both going to get in trouble.”

Trent tried to describe how this group learning process took place within their department. “It’s dynamic to watch. It would be kind of funny I suppose if we were sort of in a cage. We tend to congregate around ideas. Somebody will say something and then there will be a little debate. I think the purpose of that debate is to get to the result or to conclude that this new idea is better or that the old idea is better.” When asked about content he stated, “It could be anything including safety-related, it could be technique or … It is the funniest thing, everything will just stop for a few minutes and we just hit that subject as hard as possible whether its a safety idea or it could be a technique idea – often times it is a technique thing.”

He talked about how this process allowed the group to come to consensus regarding a variety of issues. Recently there was a debate regarding hand washing technique, and another on how to properly wipe down a lab bench. Both processes were being done based on standard good laboratory practice, but some minor variations were noted among the group and a subtle change was being suggested. Trent said they tended to “come together, huddle-up, discuss, and then go back apart to work.” He talked about how this knowledge might be offered by those he termed the “elders” or “mentors”, or if a new or younger employee had just returned from a class where a new technique or idea was taught. The group learning allowed the entire group to suggest, debate then decide on a joint outcome. This created consistency in the way the group worked regarding both quality and safety.
In a separate interview Lillian discussed this group learning as well. “Here, people have come from many different environments and so they come with a variety of techniques and a variety of opinions on how to deal with certain little things. But what’s nice about our group is we sort of sit down and have discussions if we see a difference and we sort of come to a consensus and we make an agreement.” She believed that this group process provided them with a rich source of learning that could not be shared as effectively in any other manner. “We all sort of have different experiences we bring to the table when trying to make those decisions. Different things we’ve been told, or taught, or read, or whatever. Many of us have quite a few years behind us so we’re able to pull from all those years and say okay, this is why we should, this is why we shouldn’t.”

Lillian talked about how she believed everyone felt about this method of learning. “We love to share information; we actually like to do that. None of us are trying to outdo each other; we like to talk.” She went on to say, “We don’t always end up with, ‘yeah that’s a great idea.’ But we’re like okay we’ve at least sort of weighed all of the suggestions, and we agree that that one would work.” She talked about how it affects the group as a whole “It makes us stronger. There are personality types that feel threatened by someone else’s knowledge but we’re fortunate we don’t have those personality types within our department. We actually welcome other people’s knowledge.”

As a result of this shared learning and the cohesion of the department that has developed, Lillian had complete trust in all of her co-workers and their mastery of quality and safety. She said, “Just working with them every day and I mean every day you’re right there with them. Running assays alongside them or working through projects with them. I’ve
learned that my co-workers have quite a bit of knowledge and they’re high level of ethical whatever. I know that that’s there.” She summarized her feelings regarding her co-workers by using her personal standard to which she judged the quality of the work performed by others. She said, “I know any of those people in there I would trust to run an assay with my own family samples.”

Summary

Participants provided a number of experiences that gave them the basis for incorporating workplace safety as a practiced value. For many, this was a starting point for learning safe work practices. Learning occurred by seeking mentors who were good role models for safety, as well as role models for quality. Learning safe practices included modeling behavior after those they selected as mentors. They also reported recognizing whom they did not want to use as a mentor. Most of the participants also described ways in which they in turn taught other co-workers, or those seeking mentors. This learning as well as teaching occurred simultaneously and informally. Formal training was expressed as a way to supplement the daily learning that took place. For some, formal training was disregarded when it was perceived as not being legitimate. Experiences and learning that occurred outside the workplace was applied inside the workplace, as well as the other way around. Learning concepts were often different that those traditionally taught in formal training.
CHAPTER FIVE

This chapter summarizes the conclusions from the research questions examined, the implications from the findings, and lastly, recommendations for practice and future research.

The purpose of this study was to understand how learning occupational safety practices occurred for employees outside of, and in addition to, what was taught through planned, intentional safety training. To accomplish this it was important to determine how employees selected the safe work concepts that they believed were important and then to determine how they in turn learned those safe work concepts that were incorporated into their practices. This provided insight into how they came to see the work practices within the context of their employment, and why they chose to make them a part of their personal repertoire of safe practices.

The research in the area of occupational safety indicated that while workplace safety training played a vital role in reducing the number of workplace injuries and accidents, there continues to be considerable work needed in reducing these numbers further (Hagan, P.E., Montgomery, J.E. and O'Reilly, J. T., 2001). Science, engineering and technology have provided a solid foundation in establishing appropriate and abundant safety training content that has certainly lessened the frequency and severity of workplace injuries (O'Reilly, 2001). However, knowledge of this content in itself did not mean that the employees incorporated these safe practices addressed in formal training. Transfer strategies were utilized to increase the application of traditional classroom training to the workplace. These strategies have had an impact on increasing training transfer (Broad and Newstrom, 1992), as have behavioral based safety programs (Geller, 1996; Hans, 1996), yet barriers to transfer still exist (Broad
and Newstrom, 1992; O'Driscoll, 1999; Pratt, 1998). Through the research questions the apprenticeship perspective of teaching (Pratt, 1998), and to a greater extent, situated learning theory (Billett, 2001; Lave, 1988; Lave & Wenger, 1991) were explored. The researcher explored how unintentional, informal situated workplace safety played a role in employees’ learned safe practices.

To this end, the research sought through qualitative analysis to further identify and describe the following:

- What were the safe practices that employees chose to incorporate into their lives, and in addition to, or apart from, structured or planned training?
- How did employees learn the safe practices that they truly believed were important and chose to incorporate into their lives and work practice?

**Conclusions**

Conclusion 1. Participants in this study learned safety knowledge and skills and developed safety concepts through experience with specific tools, equipment and environments.

According to Lave and Wenger (1991), a tool or artifact can be viewed as a concept as well as the traditional definition of being a physical implement used in a vocation. In this regard, according to Merriam-Webster (2004), reification is “regarding something abstract as a material thing.” Wenger uses the concept of reification in broader terms, “to refer to the process of giving form to our experience by producing objects that congeal an experience
into ‘thingness’. In doing so we create points of focus around which the negotiation of meaning becomes organized.” Concepts such as a SOP used at this facility have meaning within the community of practice but not necessarily outside the community of practice. According to Wenger, “This form then becomes negotiated meaning, for example as people use a law to argue a point, use a procedure to know what to do, or use a tool to perform an action.” As Lave and Wenger (1991, p. 102) emphasize, “It does not apply to technology only, but to all forms of access to practice.” The participants reified the concepts they developed regarding safety in a way that made them useful and allowed them to create meaning for themselves and other participants within their communities of practice.

The participants in this study learned safety knowledge and skills in a variety of settings and consequently developed a variety of conceptual tools that were useful. This conceptual learning was negotiated specifically within a setting, though once established or reified was transferred to other settings as well. For example, a concept that was described by more than one participant was the combined use of personal protective equipment and safety shower/eye wash. In this situation the learned safety practice was how to properly use safety glasses or goggles, and what to do if they were not worn or if they failed. As James described his three experiences as well as his conceptual tool, it was clear that this conceptual content had grouping that was very coherent, cohesive and most importantly realistic to the participant. Once established, he carried this conceptual tool with him to other settings and attempted to show new employees how to use it.

Lave and Wenger (1991) further discuss the use of tools and artifacts within the context of the community of practice. Lave and Wenger discuss how tools and artifacts
become “transparent” with use and familiarity. This means, “The true workings of the artifact or tool become available by the user and for the learners’ inspection” though not necessarily by those outside the community of practice. James learned how to use these tools (eye wash and shower) efficiently and very effectively, and as such their use became second nature or transparent to him. Their use was also closely tied to the use of PPE, which collectively became his safe conceptual tool and part of his practice. He further developed the ability to know where these “tools” were located throughout the facility again demonstrating even further their “transparency”. In essence, James became an expert in the use of this equipment, in a way that in all likelihood could not have been developed outside the context of the workplace experience. As Hanks (1991) states, “Situated learning implies a highly interactive and productive role for the skills that are acquired through the learning process. In situated learning the individual learner is not gaining a discrete body of abstract knowledge that he or she will then transport and reapply later in contexts. Instead, he or she acquires the skill to perform by actually engaging in the process” (p. 14).

Other safety concepts learned through situated learning were likewise seldom concrete, specific, or in depth compared to the general safety standards promulgated by OSHA. Instead they were broad and applicable to multiple settings. Concepts such as “spatial safety awareness” and “don’t hesitate, respond quickly” were described by participants. These were learned and developed concepts that incorporated segments or pieces of more traditional workplace safety practices.

Spatial safety was a descriptive term used by the researcher to summarize a concept described by the participants. Betty, for example, had developed this concept of spatial
safety or “just being aware of where people are” in relation to each other, while working as a lifeguard and having the experience of rescuing a drowning child from a pool. For her and the other lifeguards in this community of practice, the concept of spatial safety was a very clear conceptual tool, though difficult for her to explain, particularly to someone outside that community of practice where “transparency” of spatial safety might not be available. This concept and its meaning within the community of practice of the lifeguards was part of the shared repertoire and negotiated meaning that is described by Wenger (1998). Once the tool was developed and used, Betty continued to apply spatial safety in other work settings including her present occupation. The researcher easily identified these conceptual tools described, although not as being commonplace from a traditional safety perspective.

While these reified conceptual tools were, for the participants, easily understood and carried by them to other settings, the concepts were also not those whose content could have been easily taught through a transmission training perspective since they were not packets of explicit subject matter for hierarchal learning built on prior knowledge, and which could be easily presented in a step-by-step manner (Pratt, 1998, p.65). When a respected safety professional, trainer and colleague was asked informally if she had ever tried to train employees on the concept of “reacting quickly” or “spatial safety” in formal safety training, she responded, “No, and how could you teach that anyway?” While, from her perspective as an occupational safety expert, “How would you teach it?” may have been an appropriate response, the fact that the participants learned it still remains and the fact that they learned it from someone else, be it teacher, mentor or master, through an informal and unstructured process and transferred its meaning to another application was apparent.
Brown, Collins, and Duguid (1989) further draw on this analogy between these situated concepts and the use of tools, recognizing that “they can only be fully understood through use, and using them entails both changing the users’ view of the world and adopting the belief systems of the culture in which they are used” (p. 101). Regarding this type of learning Lave and Wenger (1991, p. 92) stated, “There is very little observable teaching. The more basic phenomenon is learning.” In this sense, any ‘power of abstraction’ is thoroughly situated, in the lives of persons and in the culture that makes it possible” (Lave and Wenger, p. 33). Like a tool in Brown, et. al. analogy, one must only imagine trying to explain to someone how to use a handsaw, without actually having a saw or any actual wood on which to practice.

Conclusion 2. Participants in this study learned safety knowledge and skills by transferring and negotiating meaning with life experiences beyond the initial experience.

Many of the situated safety lessons and concepts learned by the participants were carried with them to different environments and settings where they were applied, used, and refined, or as Brown, Collins, and Duguid (1989), described, “progressively developed though activity” (p. 101). Many of the experiences described by the participants occurred outside the work place with the lessons learned being transferred by the participants into and throughout their work lives.
It was necessary for the researcher in this study to move the focus of the interview questions out of the workplace and into the non-workplace setting in order to allow the participants to address learning rather than formal teaching exclusively. It is recognized that this adjustment may have strengthened the participants’ perception of the relation between non-workplace to workplace safe practices. The movement of knowledge, however, from one community of practice to another was common in this study and is supported by Billett’s (1998) research regarding participation in various communities of practice. He states, “Throughout our ontogenies, the different communities in which we engage furnish opportunities for ongoing thinking, acting and the learning required for everyday life. The range of experiences will differ, as will the ability to be involved and individuals’ interest in being involved, all of which will influence the scope and quality of participation. Taking the Vygotskian view, these differences in inter-psychological experiences will have different kinds of intra-psychological consequences” (p. 10).

The participants in this study did not see or speak of their lives as fragmented into sections: work, home, military, but instead as a continuous collection of life’s experiences, learning, and knowledge. Wenger (1998) states that negotiated meaning does not end as participants leave one group and enter another. “Their participation is not something they simply turn off when they leave. Its effects on their experience are not restricted to the specific context of their engagement. It is a part of who they are that they always carry with them and that will surface at other times and in other settings” (p 57). Trent’s understanding and appreciation for PPE at home, with his use of a bicycle helmet, transferred into a level of appreciation for wearing PPE at work. Renee’s comprehension of biosafety was conceptually
as applicable at work on the lab bench as it was at home on the kitchen counter. Greg’s appreciation for electrical safety began as a child in his uncle’s house, but became a part of his safety repertoire throughout his personal, military and work life. The participants’ practices at this organization was an accumulation of all their past experiences and learning brought together.

The transference of these concepts was very viable and usable by the participants. One participant described his “react quickly” lesson learned as the result of a motorcycle incident as a child. The researcher was fascinated by the fact that the life lesson from a motorcycle accident could translate and transfer into the ability to properly use an eyewash. For this participant, however, learning to react quickly was what allowed him to prevent a serious incident from occurring.

Conclusion 3. The participants in this study used stories as a vehicle for learning and sharing safe work practices, knowledge and skills to other participants.

The safety concepts were learned not just through direct self-experience, but through association with employees or families that had the experience and also through the sharing of stories. The participants often used stories to relay the safety lessons not only to the researcher, but to others as well, sharing their experiences. Lave & Wenger (1991) address how the use of stories allows the lessons to be easily generalized and transferred to other settings and circumstances. They point out, “Generality is often associated with
abstract representations, with decontextualization. But abstract representations are meaningless unless they can be made specific to the situation at hand. Knowing a general rule by itself in no way assures that any generality it may carry is enabled in the specific circumstances in which it is relevant” (p. 33). Lave and Wenger go on to say, “That is why stories can be so powerful in conveying ideas, often more so than an articulation of the idea itself” (p. 34). For these participants the concepts were effortlessly generalized to other settings. The stories that relayed the message had meaning beyond just the lesson learned. Stories were powerful and rich in detail and emotion. As such they created, “an emphasis on the comprehensive understanding involving the whole person regarding activity in and with the world; and on that view the participant, the activity and the world mutually constitute each other” (Lave and Wenger, p. 33).

Lave and Wenger (1991) discuss the importance of stories in their research on the apprenticeship process of midwives. They state, “What happens is that as difficulties of one kind or another develop, stories of similar cases are offered up by the attendants. In the ways in which these stories are treated, elaborated, ignored, taken up, characterized as typical and so on, the collaborative work of deciding on the present case is done. These stories then are packages of situated knowledge” (P 108).

Participants shared information and knowledge through their stories freely with co-workers while simultaneously listening to stories and learning from co-workers. Wenger (1998) discusses the importance of stories as a tool in a community of practice. He states, “Stories can transport our experience into the situations that relate and involve us in producing the meanings of those events as though we were participants. As a result they can
be integrated into our identities and remembered as personal experience, rather than as mere
reification” (p. 203). Stories were used by a number of the participants in relaying
information to the researcher, and as a way of providing knowledge to co-workers as well.
Even the formal safety training that had the most value for the participants included the use
of stories to relay the information.

These stories, as they were told, were often filled with emotional content and
significance that provided the participant a richer, more meaningful experience than could
have been provided outside of the context in which they occurred. For example, one
participant’s sharing an experience of an adult friend’s head injury from a motorcycle
accident provided not just the lesson from the actual injury, but conveyed the impact that the
injury had on the family, social activities, individual development, and all the subtle elements
in which that person’s life was affected by not wearing a helmet.

Conclusion 4. Participants in this study learned safety knowledge and skills through
social groups or communities of practice.

Lave and Wenger (1991) stated, “Legitimate peripheral participation provides a way
to speak about the relations between newcomers and old-timers, and about activities,
identities, artifacts and communities of knowledge and practices. It concerns the process by
which newcomers become part of a community of practice. A person’s intentions to learn are
engaged and the meaning of learning is configured through the process of becoming a full
participant in a sociocultural practice. This social process included, indeed it subsumes, the learning of knowledgeable skills” (p 29).

Learning safe work practices in this study often occurred through the employees’ peripheral participation within the communities of practice. This learning occurred as participants interacted socially with other members of the community sharing knowledge, stories and negotiating meaning regarding the work being performed. The participants in this research expressed the ability to identify and select mentors in their community of practice. Billett (2001) states that interaction with the mentors “include telling, explaining and making explicit what would otherwise remain unknown by learners. Experts can provide assistance by providing ‘tricks of the trade’ and heuristics (problem solving strategies) that learners are unlikely to discover independently” (p. 78). The participants described this process as co-workers took them under their wings, or showed them the ropes or as they in turn mentored other co-workers. The sharing of this knowledge occurred not only in a vertical hierarchical fashion in movement from experienced practitioner to novice, described by Lave and Wenger (1991) as legitimate peripheral participation, but also occurred horizontally between co-workers as stories and experiences were shared with others. Lave and Wenger recognized this horizontal movement of knowledge as well, “It seems typical in apprenticeship that apprentices learn mostly in relation with other apprentices. There is anecdotal evidence that where the circulation of knowledge among peers and near-peers is possible, it spreads exceedingly rapidly and effectively” (p. 93).

In this study the participants were both the mentor and the mentored simultaneously in their relationships with other co-workers. As Lave and Wenger (1991) state, “In the terms
proposed, there may very well be no such thing as a ‘legitimate peripheral participant.’ The form that the legitimacy of participation takes is a defining characteristic of ways of belonging, and is therefore not only a crucial condition for learning, but a constitutive element of its content. Similarly, with regard to ‘peripherality’ there may well be no such simple thing as ‘central participation’ in a community of practice. Peripherality suggests that there are multiple, varied, more- or less-engaged and inclusive ways of being located in the fields of participation defined by a community. Peripheral participation is about being located in the social world. Changing locations and perspectives are part of actors’ learning trajectories, developing identities, and forms of membership” (p. 39).

In relation to a mentor the participants used a number of methods to learn and incorporate the skills they sought. These methods are common in an apprenticeship approach and include modeling, coaching, and scaffolding. Billett (2001) described the ways in which knowledge is shared among co-workers. The concept of modeling allows the novice an opportunity to observe an expert perform the task. The idea of observation is critical to modeling because it allows the novice to get “the big picture” and begin to form a schema in which future learning will be incorporated. Modeling also allows a point of reference within the context in which the task will be used. New employees often observe the processes and this was described by a number of participants.

Scaffolding occurs when novices try to perform new tasks and are supported by the mentor. The support is provided in a way in which the mentor is sensitive to the individual needs of the novice and is also encouraging or coaching. Coaching is used to further support the activity (Billett, 2001). Ryan learned the safe and correct way to operate boilers from his
“big three” supervisors in this manner, and he in turn used these techniques to pass safety information along to others. The participants used these techniques almost intuitively as they worked within their community of practice. Billett states that these are used intuitively by most people in a variety of settings and provides the example of a mother teaching a child how to cook, or when teaching someone how to drive a standard shift automobile.

Participants in one department described their community of practice as relying on this sharing of information, knowledge, and skills openly amongst co-workers. This community of practice had evolved into a learning organization similar to that described by Senge (1994) and Marsick & Watkins (2001). This process of negotiating meaning was not only recognized by the participants of this community, but was expected and viewed as the major source of learning and professional development within their work area. This became the vehicle for learning safety as well as a way of learning general workplace skills within this community of practice.

The participants in this community of practice discussed the tools of their practice such as pipetting, the use of pressure vessels and working with specimens as ways of describing work and work practice concepts in their community of practice. These tools or artifacts became an integral part of the learning process, as did their use. Lave and Wenger (1991) state, “Participation involving technology is especially significant because the artifacts used within a cultural practice carry a substantial portion of that practice’s heritage” (p. 101). Learning to perform and work with these tools safely and masterfully was very highly regarded among the participants in this community of practice. The learning
transcended from teaching what a pipette is and how to use it, to knowing the nuances and tricks in using it masterfully.

Conclusion 5. Participants in this study selected and gave power over their safe work practice learning to those they recognized as leaders or mentors.

In the various communities of practice, participants sought safety mentors as a way of learning and gaining knowledge, and believed they were able to identify appropriate mentors. The role of the mentor was often implied and not explicitly defined. A participant’s ability to select a mentor for safe practices was based on who performed work in a skillful and highly qualified manner, and not necessarily the co-worker who was assigned as mentor. Billett (2001) states, “Not surprisingly, workers decide which co-workers possess the kinds of expertise they wish to develop and who they see as credible guides. Consequently, there can be no guarantee that workplace learners will grant this status to those nominated as workplace mentors or those labeled as ‘trainers’” (p. 116).

While participants believed they could easily identify these characteristics in the mentors they had difficulty describing these tacit characteristics verbally. As one participant stated, “Like Michael Jordan throwing a three-pointer…you can just tell by watching someone’s form.” Using these ill-defined, tacit characteristics the participants identified and self-selected co-workers from whom they wanted to learn safe practices as well as identified from whom they did not want to learn. The identified mentors were described as mindful of their practice and viewed as concerned with the quality of their work. The employees who
lacked these skillful or mindful characteristics were those who were generally not selected as mentors and were often the ones participants recognized as involved in an incident or accident. Billett (2001) states, “Individually are unlikely to construct knowledge uniformly or without reflection on their beliefs and procedures. For example, workers exposed to unethical activity or unsafe working practices are likely to make judgments about those activities. Some might accept these practices unquestioningly, or do so because they want to gain acceptance within a group. Others may refuse to accept certain situations even when those situations are accepted as useful practices. It is important to be aware that workplace learning is not simply imitative, merely reproducing what is encountered. It can be interpretative and reflective, and even critical” (p. 38).

Formal safety training was viewed as an additional source for safety information and participants expressed seeking formal training, much like seeking a mentor when there was a perceived value. Although formal safety training was a source of information it was not necessarily described in this study as the primary source. Trent sought more information on proper pipetting once he recognized the importance, and he obtained information from a class in addition to working with others. Andy and Lillian both sought more information regarding First Aid once it was a value or important to them to do so. A number of participants sought more information on chemical safety through formal training once they had an experience that made knowing about chemicals important to them.

Just as participants were able to learn and self-select mentors, they were also able to learn and self-select safety training that was valid and invalid. Similar to selecting a mentor, if misinformation was provided during the formal safety training or there were concerns
about the trainer qualifications and familiarity with the subject then the information was ignored by participants. Lave and Wenger (1991) found similar scenarios in their research regarding situated learning and Naval Quartermasters where a chief said, “They preferred to get their trainees as able-bodied seamen without any prior training in the school. They said this saved them the trouble of having to break the trainees of bad habits acquired in school” (p. 73). A similar striking example was described when formal training provided information that the employees recognized was wrong on completing a procedure in a SOP. The outcome of this scenario was as Steven said, “Ignore formal training, because they don’t know how it is really done.”

**Implications**

The implications derived from this research suggest that informal and unstructured learning, both intentional as well as unintentional, is occurring in addition to, and outside of, the formal safety training setting. Although safety professionals have been providing safety training for decades and certainly need to continue doing so, there needs to be a greater understanding and perhaps emphasis on learning that is also taking place *in situ* or within the context of the work being performed. Because this learning *is* occurring regardless of what is being taught formally (Lave, 1998), it would seem advantageous to not only acknowledge it, but to explore ways to reinforce and leverage the workplace safety information that is being provided.
Although the safe work practice concepts discussed by these participants may have been limited by population, sample size, and context of this specific work place, the concepts they held were considerably different than those often delivered through formal safety training. This difference implies that perhaps the general population does not easily comprehend the formal safety programs and content that is traditionally delivered. The safety concepts that were described by the participants indicated that they had established their own very clear concepts of safe work practices, and these practices worked well for these participants. The traditional workplace safety principles, developed by industry consensus or professional organizations and often adopted and reflected in the OSHA Standards, perhaps do not generalize to the participants’ practice as easily as their own “homemade” safety concepts. In this regard Rogoff and Lave (1999) state, “What is regarded as logical problem-solving in academic settings may not fit with problem solving in everyday situations, not because people are ‘illogical’ but because practical problem-solving requires efficiency rather than a full and systematic consideration of all alternatives. In everyday situations thought is in the service of action. Rather than employing formal approaches to solving problems, people devise satisfactory opportunistic solutions. Everyday thinking, in other words, is not illogical and sloppy but instead is sensible and effective in handling the practical problem. In many cases, the more systematic and precise approach would result in less effective practical action since it would take more effort to develop and would be less flexible in the face of unanticipated opportunities of constraints. Effective practical problem-solving may proceed by using tacit knowledge available in the relevant setting rather than by relying on explicit propositions” (p.7).
Typically the formal occupational safety training that is developed and delivered is based on objectives and concepts derived from the requirements of the OSHA Standards, and these standards originally emphasized workplace safety from an engineering perspective. Perhaps it would be advantageous to explore and better understand these reified, practical concepts of safety that the general population hold and understand, and then find a way to deliver the safety content in a way that works for the employees. In her research in mathematics Lave (1988) points out, “Practice in everyday life is of interest beyond its immediate scope and value to practitioners because of these relations between theory, practice and the attribution to subjects’ practice of a common set of principles. One way to rethink models of mind is to reexamine cognitive processes that have been infused with a specific theoretical meaning by contemporary cognitive theory, as has mathematics. In short, a different description of the phenomenon may provide grounds for pursuing a different problematic approach of cognition altogether” (p. 6).

Rather than putting the burden of transferring the abstract nature of the OSHA Standards to the work setting on the shoulders of the employee, perhaps the burden of making the unfamiliar, technical and abstract safety information practical and real should be placed on the safety professional’s shoulders instead. Covey (1989, p. 235) states so appropriately, “Seek first to understand, then to be understood.” Safety professionals need to determine employees’ views on the subject, how this information will be used, and how to make it real for the employees whose lives we want to protect. In other words, rather than attempting to deliver a great quantity of in depth, safety content through training sprinkled with adult learning principals, consider instead the broad schemas developed by adults
learning contextually while infusing small amounts of technical content as needed. As Lave and Wenger (1991) explain, “This leads us to distinguish between a learning curriculum and a teaching curriculum. A learning curriculum consists of situated opportunities for the improvisational development of new practice. A learning curriculum is a field of learning resources in everyday practice viewed from the perspective of learners. A teaching curriculum, by contrast, is constructed for the instruction of newcomers. When a teaching curriculum supplies, and thereby limits, structuring resources for learning, the meaning of what is learned (and control of access to it, both in its peripheral forms and its subsequently more complex and intensified forms) is mediated through the instructor’s participation, by an external view of what knowing is about. The learning curriculum in didactic situations, then, evolves out of participation in a specific community of practice engendered by pedagogical relations and by a prescriptive view of the target practice as a subject matter, as well as out of the many and various relations that tie participants to their own and to other institutions. A learning curriculum is essentially situated. It is not something that can be considered in isolation, manipulated in arbitrary didactic terms, or analyzed apart from the social relation that shape legitimate peripheral participation” (p. 97).

Secondly, there were a number of concepts that easily transferred from one setting to another and there were reportedly more safety concepts originating in the non-work setting that transferred to the workplace, than the other way around. Non-work to work safety conceptual development provided for many participants more meaning and easier assimilation than work to non-work safety or work place safety alone. In other words it was often easier for participants to comprehend and discuss safety concepts learned outside the
workplace. This became initially clear when the researcher had to refocus questions so the participants could understand the concept of learning safety. While the researcher realizes that this finding may have been created and strengthened by the line of interview questioning focused originally on non-workplace safe practices, it may also imply that a non-work connection may be easier to understand and perhaps provides a more solid groundwork on which to build safe work practices. Certainly a better understanding of this transfer from one setting to another should be explored. Regardless of the reason for the transfer the fact that movement of safety concepts from one setting to another was occurring. As explained, these participants did not see their safety or their lives as segmented. While safety professionals provide training on workplace safety and perhaps add applicable home safety knowledge when resources and time allows, it may be worth considering using safe practices from a variety of other settings including home as the basis or framework for workplace safety.

A third implication would suggest that the participants who had experiences that provided a basis for learning safe work practices were quite willing to share these experiences and stories with others. Regardless of a resulting injury or negative experience, employees shared their stories with others informally and recognized them as learning opportunities. The use of these stories were a powerful learning tool informally and should be considered formally as well. The participants did not see or describe themselves as being disobedient of the safety rules, but instead they viewed their experiences as a learning opportunity. They shared information freely with co-workers. In fact it may be that perhaps the only person they are hesitant to share the stories with is the safety professional.
Finally, the use of situated learning was very important in the development and delivery of safety knowledge in the workplace. The implication that this type of learning is occurring and should be further developed is important. The learning that occurs in the workplace within the community of practice plays a significant role in providing safety skills to employees. This learning is provided when it is needed, where it is needed and in a quantity that the employees can easily assimilate. The use of mentors or masters regarding occupational safety and the further use of this informal learning would be a benefit in developing the safety program. While the argument certainly could be made that employees showing co-workers “the ropes” open the door for considerable liability from the potential delivery of misinformation, certainly the same argument could be made in formal safety training if, for example, the trainer is delivering misinformation regarding a SOP. In this case it was the participant acting as mentor who corrected the safety information that had been provided formally. Providing corrective information was even seen as a responsibility of the employees.

In general, the implication from this research indicates a need for further exploring this system of learning that is taking place and finding ways to leverage its effectiveness.

**Recommendations**

The purpose of this study was to understand how learning safe work practices occurred for employees outside of, and in addition to, what was taught through planned, intentional safety training. To do this it was important to determine how employees selected
the safe work concepts they believed were important and then to determine how they in turn learned the safe or unsafe work practices they believed to be important and decided to incorporate into their work lives. This research provided insight into how employees come to see safe work practices as important within the context of their job and perhaps, to a greater extent, to their life in general. This research also provided insight into how learning these safe practices occurred and began to explore ways in which safety professionals can leverage this learning to help establish safer workplaces.

A number of recommendations can be made related to the research that may serve to refine future research in this area. First, the population for this study was limited to a facility that generally emphasized the importance of safety. This site was selected for specific purposes stated in Chapter Three. While this was an ideal setting from the researcher’s perspective and generally most of the participants’ learning related to experiences that occurred at other facilities, it would be valuable to conduct research in a variety of workplace settings including those where there is less emphasis from the employer on workplace safety. Conversely, more research should be conducted in workplaces where an even greater emphasis is placed on workplace safety such as Voluntary Protection Plan (VPP) sites. VPP is a prestigious safety award given by OSHA to organizations that have exemplary workplace safety programs.

Secondly, selecting a population where the researcher has had little or no contact should also be considered for future research. This site was selected in part because there were very few barriers in access to the population allowing the researcher to focus intently on
the interviews. This also provided a comfort zone for the participants to speak freely. Other populations with less contact may produce other findings.

Third, the number of participants was limited which, in turn, may have provided a limited picture of the research results, although again, most participants spent more time discussing previous work experiences. By expanding the population size and perhaps focusing more on their present employer, a more “systems” perspective of this unstructured learning would be revealed.

Fourth, although it was not the purpose of this research to focus specifically on the concept of mastery, the importance of mastery in the participants’ learning was clear. The participants felt very comfortable in selecting mentors or masters as they learned safe work practices. More research will be required to determine the characteristics of the mentors or masters that employees select and chose to follow. Research would also determine if mastery in one area, such as workplace safety, relate to mastery in another area such as quality. While the results of this study indicate that quality and safe practices are closely tied, it is important to better understand this relationship as well as relationships to other areas of expertise.

Fifth, safety professionals should begin exploring and leveraging the safety learning that is taking place in the workplace. It must be kept in mind that the purpose of this study was not to demonstrate that situated learning should be used, but that situated learning is being used by employees, whether safety professionals want it to or not. It is therefore worthwhile to explore ways to work jointly with the employees who are teaching others “the ropes” to ensure that their information is sound and correct in addition to being real. In this way, rather than focusing solely on formal safety content being pushed into context using
transfer strategies, perhaps safety professionals would work within the context of the tasks being performed while pulling in safety content. One area where this is being explored by this researcher includes selecting workplace safety “mentors” or employees who may demonstrate leadership skills in work and safety. These mentors are provided with the knowledge and skills needed to perform their jobs in a professionally safe manner. These mentors in turn would deliver in context, the safe practice skills to other employees and coworkers through day-to-day activities. In this manner the knowledge and skills become embedded within the workplace culture rather than delivered outside of the work environment (training room) with the expectation that they will be transferred. With a collaborative approach the safety professional would act as co-worker and advisor assisting the workplace mentors in providing sound workplace safety knowledge while collaborating in making sure the content is appropriate for the context. In other words by recognizing that the workplace mentors are the teachers, the safety professional can assist them in understanding and incorporating appropriate safe practices. Billett (2001) states, “Collaborative problem-solving of this kind is viewed as being more important for individuals’ construction of knowledge than the transmission of knowledge from one individual to another through direct teaching” (p. 19).

Sixth, regardless of a resulting injury or negative experience, employees should be used as champions and encouraged to share their stories with others, especially since learning was enhanced formally and informally through the use of stories. By capitalizing on these employees to “spread the word” these stories can become good learning opportunities for others. The researcher is familiar with only two situations where employees involved in
incidents are used in this fashion. Both of these are Voluntary Protection Program Sites (VPP). One VPP organization has established a committee where all employees involved in incidents are automatically members. This committee is used to help establish safety guidelines that are used throughout the organization and has reportedly been very effective in its efforts. Another organization uses these employees to provide training through the use of testimonials. The safety professional at this organization has spoken highly of the results of this program and the success it has had on reaching other employees. In this research the stories provided by the participants were very powerful, emotional and full of detail. It was the detail, emotion and realism that made the message clear to the researcher as it was to the other employees.

Finally, it is important to find new ways to “package” formal safety training that builds on the employees’ concepts regarding safety, and focusing less on training content driven by compliance based on the OSHA Standards, particularly if concepts based on OSHA Standards are not easily understood or transferable. Participants held safe work schemas that were broader conceptually in the hazards they covered than those provided in training based on the formally structured OSHA Standards. Building on these schemas might enhance workplace safety understanding, for example, discussing PPE in combination with showers and eyewashes. To build on these schemas, further research would be needed to understand these concepts and how they are formed for employees.

In conclusion, further research needs to be conducted to more fully understand the impact of situated learning in the workplace. While certainly the researcher is not advocating that formal occupational safety training be discontinued, it may be discovered that the
impact situated learning has in regards to workplace safety may be significant enough to warrant more resources allotted to this type of learning. It may also be discovered that the return on investment from situated learning may exceed that of formal safety training. By focusing less effort on formalized safety training and more on the informal yet valuable learning affordances that are occurring in the workplace, the knowledge, skills, and abilities that employees need to work safely would be readily available and perhaps easily incorporated into the daily work activities.

Lave and Wenger (1991) believe that this research in general is needed and they say, “We would predict that such an investigation would afford a better context for determining what students learn and what they do not, and what it comes to mean for them, than would a study of the curriculum or of instructional practices” (p. 41).
REFERENCES


Griffin, Marlynn M. & Griffin, Bryan W, (Summer 96), Situated cognition and cognitive style: Effects on students' learning as measured by conventional. *Journal of Experimental Education, 64*(4), 293-309.


APPENDICES
Appendix A
Site Approval

May 30, 2003

Director RTP Administration

Dear Sir,
Thank you for allowing me to conduct employee interviews for my doctoral dissertation on adult learning. I’m hopeful that the insight gained will be beneficial to your organization as well as other organizations wishing to improve learning opportunities through workplace initiatives. The purpose of this letter is to reiterate the things we discussed and get your written approval for your organization’s participation in the research. The research method will be a qualitative phenomenological study consisting of in-depth interviews exploring how people learn on a daily basis during their normal work place activities. Hopefully this will allow us to explore new ways to provide learning experiences to employees outside the classroom setting.

All department heads and supervisors will be asked for approval prior to the employee interviews. The interviews will be conducted with a small number of employees at a time that is convenient to the employee and their supervisor. Generally this will be during lunchtime. All interviews will be audio taped for ease in note taking and to allow me to focus on the employees. The audiotapes will be destroyed after they have been transcribed. All employees’ names will be kept confidential as will your organization’s name. Interview will be strictly voluntary and employees will all be given letters and consent agreements.

I value your willingness to participate and your commitment of time, energy, and effort.

If you have any questions regarding this research, please do not hesitate to call me at (919) 676-2877, or the chair of my dissertation committee, Dr. John Pettitt at (919) 515-6291 at North Carolina State University, College of Education, Department of Adult and Community College Education.

Sincerely,
David Machles

I grant permission for the above interviews to be conducted at this facility.

________________________________________ Date __________________
Appendix B

Letter to Participants

Date_________

Dear_________

Thank you for your interest in my dissertation research on learning occupational safety through daily experiences and activities. I value the unique contribution that you can make to my study and I am excited about the possibility of your participation in it. The purpose of this letter is to reiterate some of the things we have already discussed and to secure your signature on the participation-release form that you will find attached.

The research model I am using is a qualitative one through which I am seeking comprehensive descriptions of your learning experience. In this way I hope to illuminate or answer my question: “How do people learn those safety practices that they have decided to incorporate into their lives?”

Through your participation, I hope to understand the essence of learning through everyday activities as it reveals itself in your experience. You will be asked to recall specific episodes, situations, or events that you have experienced during your everyday lives. I am seeking vivid, accurate, and comprehensive portrayals of what these experiences were like for you: your thoughts, feelings, and behaviors, as well as situations, events, places and people connected with your experiences.

I value your participation and thank you for the commitment of time, energy, and effort. If you have any further questions before signing the release form or if there is a problem with the date and time of our meeting, I can be reached at (919) 676-2877.

Best Regards,

David Machles
Appendix C

North Carolina State University
Informed Consent Form for Research.

The Role of Situated Learning in Occupational Safety
David Machles Faculty Sponsor – Dr. John Pettitt

I am asking you to participate in a research study. The purpose of this study is to understand how safety is learned.

*Information*
If you agree to participate in this study, you will be interviewed regarding your learning experiences. The interviews will last from about one to one and a half hours. All interviews will be audio recorded for ease in transcription and will be destroyed once the transcription is completed.

*Risks*
There are no foreseeable risks associated with this research.

*Benefits*
There are no direct benefits expected for the participants of this research, however knowledge gained from this research will be made available. It is expected that the results of this research will provide insight to adult education methodologies.

*Confidentiality*
The information in the study will be kept strictly confidential. Data will be stored securely in a locked desk. No reference will be made in oral or written reports that could link you to the study.

*Compensation*
There is no compensation for participating in this study, however since the interviews may be conducted off site during lunch, your lunch will be provided by the researcher.

*Contact*
If you have questions at any time about the study or the procedures you may contact the researcher, David Machles, at 8374-104 Six Forks Rd, Raleigh, NC 27615, or (919) 676-2877 x 11. If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact Dr. Matthew Zingraff, Chair of the NCSU IRB for the Use of Human Subjects in Research Committee, Box 7514, NCSU Campus (919/513-1834) or Mr. Matthew Ronning, Assistant Vice Chancellor, Research Administration, Box 7514, NCSU Campus (919/513-2148)

**PARTICIPATION**
Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at any time without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed your data will be returned to you or destroyed at your request.

**CONSENT**
“I have read and understand the above information. I have received a copy of this form. I agree to participate in this study with the understanding that I may withdraw at any time.”

Subject's signature_______________________________________ Date _________________

Investigator's signature__________________________________ Date _________________
Appendix D

Interview Question Guideline

The following verbal instructions will be provided during the interviews:

- What do you consider to be the most important things you do on your job?
- What is important in doing these things well?
- What is important in doing these things safely?
- What things represent what others in your work consider important, what is valued?
- How did you learn these things?
- From whom did you learn these things?
- What were the characteristics of those who taught you these things?