

Learning actions of fire fighters using best practices
by Brian Martin Crandell

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Education in Education
Montana State University
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Abstract:
Fire fighters, nationally and in Montana, face significant hazards in their work.

To work effectively and avoid injury and death, fire fighters must effectively train in many subject areas. Fire fighters, as adult learners, learn by various learning actions from various sources. This study examined the learning actions and learning sources used by selected fire fighters recognized as using best practices in preparing a safe and competent workforce.

This qualitative research used researcher-developed interview questions, a rating of sources questionnaire, and observation of artifacts to investigate the learning actions and learning sources used by selected fire fighters who were recognized as using best practices in preparing a safe and competent workforce. The participants were selected by a group of Montana fire fighters who served as field staff members or advisory council members from the Montana Fire Services Training School. Each of the 15 members of the selection group identified fire fighters they recognized as using best practices in preparing a safe and competent workforce.

Nineteen participant fire fighters were recognized as using best practices in preparing a safe and competent workforce. The participants were from 17 fire service organizations and included fire service members with the ranks of fire fighter, fire officer and fire chief. The participants provided demographic information about themselves, their communities, and their organizations. The participants rated learning sources in terms of the relevance and frequency of use. They answered seven open-ended interview questions regarding learning sources and actions and provided access to artifacts including technology, facilities, procedures and records. The top learning sources and actions included observation of the deployment of fire fighters during training/drills and incidents/responses, networking with other fire fighters, and the educational products and services provided by the Montana Fire Services Training School including the resource center, electronic newsletter, courses and consultancy services. The artifacts supported the interview and survey data gathered from the participants.

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of a dissertation submitted by

Brian Martin Crandell

This dissertation has been read by each member of the dissertation committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

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ABSTRACT

Fire fighters, nationally and in Montana, face significant hazards in their work. To work effectively and avoid injury and death, fire fighters must effectively train in many subject areas. Fire fighters, as adult learners, learn by various learning actions from various sources. This study examined the learning actions and learning sources used by selected fire fighters recognized as using best practices in preparing a safe and competent workforce.

This qualitative research used researcher-developed interview questions, a rating of sources questionnaire, and observation of artifacts to investigate the learning actions and learning sources used by selected fire fighters who were recognized as using best practices in preparing a safe and competent workforce. The participants were selected by a group of Montana fire fighters who served as field staff members or advisory council members from the Montana Fire Services Training School. Each of the 15 members of the selection group identified fire fighters they recognized as using best practices in preparing a safe and competent workforce.

Nineteen participant fire fighters were recognized as using best practices in preparing a safe and competent workforce. The participants were from 17 fire service organizations and included fire service members with the ranks of fire fighter, fire officer and fire chief. The participants provided demographic information about themselves, their communities, and their organizations. The participants rated learning sources in terms of the relevance and frequency of use. They answered seven open-ended interview questions regarding learning sources and actions and provided access to artifacts including technology, facilities, procedures and records. The top learning sources and actions included observation of the deployment of fire fighters during training/drills and incidents/responses, networking with other fire fighters, and the educational products and services provided by the Montana Fire Services Training School including the resource center, electronic newsletter, courses and consultancy services. The artifacts supported the interview and survey data gathered from the participants.

CHAPTER 1

INTRODUCTION

Background of the Study

Fire is a significant problem in America. Each year fires kill 4,000 people and tens of thousands are injured. The number of fire deaths in America is 20 times the number of deaths from all other natural disasters combined. In a typical year, 100 fire fighters are among those killed by fire and 87,000 fire fighters are among those injured (USFA, 2002). Many fire fighter fatalities and injuries are preventable.

Fire fighter training programs can help reduce the incidence of fire fighter deaths and the severity of fire fighter injuries. Training prepares fire fighters to perform their work in a standard and safe manner. Training also helps fire fighters recognize potential hazards and take preventative action prior to an accident occurring, thus reducing injuries and death.

Fire fighter training occurs in several ways in Montana. Fire fighters receive training from the fire department in which s/he is a member. Fire fighters also receive training from sources outside their fire department. Fire fighter training programs are available for fire fighters in Montana from the Montana Fire Services Training School (MFSTS), a part of the Montana State University Extension Service. The MFSTS provides fire fighter training by direct training delivery to fire fighters and by supporting fire fighter training programs within fire departments.

Part of the work of MFSTS is to design and implement training programs that help improve fire fighter safety by helping fire departments prepare a safe, competent workforce. Often an indication of the need for a training program is an incident that results in the injury or death of a fire fighter. Many incidents involving injury or death of fire fighters receive extensive review.

Incident reviews, or critiques, address causal factors related to fire fighter injury or death. They also identify lessons learned or reinforced and suggest action plans for reducing the likelihood of similar occurrences. The lessons and action plans are an important foundation in fire fighter training programs used in the preparation of a safe and competent workforce. These training programs are delivered by MFSTS staff and are provided to fire department trainers for their use in delivery of these programs within their department.

In support of fire departments developing a safe, competent workforce, MFSTS training programs address the full range of fire service topics using many delivery mechanisms and approaches. MFSTS fire fighter training programs are available every day of the week, at all hours of the day and night. These programs are offered at many locations throughout Montana. Training programs are also developed for specific needs of individual fire fighters or groups of fire fighters. The training delivery methods and approaches used by the MFSTS staff are grounded in contemporary adult education methodology.

The MFSTS staff is committed to developing programs that meet the needs of its adult education customers. An important part of developing and delivering fire service adult education programs in Montana is understanding what program characteristics are

most effective for the fire fighter. In order to be a fire fighter one must be an adult, thus it makes sense to review adult learning theory.

One adult education theory suggests that effective educational program development and delivery are closely tied to understanding the adult learner. Understanding what learning sources learners use and what learning actions the learner takes can facilitate the effective implementation of an educational program.

By understanding how adults learn and what sources they find relevant and use, adult educators can design and implement appropriate programs. Adult education programs must be founded on the needs of the learner. They must be designed in a way that addresses the learning actions taken by learners.

Montana fire fighters face demanding work in a state with dynamic community needs. The service demands they must face today are a combination of old, well-established hazards and new emerging hazards. For fire fighters to be successful, they must survive the work they perform. To prepare to operate in a safe and competent manner, fire fighters have and will actively participate in many training programs. Those training programs will be most effective when the fire service adult educators design the program to address the needs of the fire fighter learner.

In order for fire fighters to access effective training and practice, that training and practice must be available. Developing relevant, valid, proactive training and practice products is achievable through established curriculum development processes. Creating opportunities and gateways for the learners to access these products is a challenge that can be effectively met by understanding what methods learners use to first encounter such information.

Fire Fighter Training in Montana

The Montana Fire Services Training School estimates that approximately 10,000 fire fighters operating through 350 local fire departments serve Montana. Montana fire departments range in size of membership from 104 fire fighters (Billings) to four fire fighters (Clarkston).

Fire fighters participate in numerous training opportunities. Members of a fire department may provide some training opportunities to other members. Fire service trainers from outside the fire fighter's department provide other training. In Montana, fire service training is provided on a statewide basis by the Fire Services Training School (MFSTS). The mission of the MFSTS is to build capability in local governments for protecting the safety of citizens, their property, the tax base and infrastructure from harm caused by unwanted fires, accidents, injuries, hazardous materials incidents and other emergencies (MFSTS, 2003). MFSTS operates with its purpose detailed in Montana Codes Annotated (MCA) Section 20-31-103. The purpose has five components, which are:

1. provide fire service personnel with professional training;
2. identify new methods of fire prevention and suppression and disseminate information about them;
3. provide a resource center for use by local fire services;
4. provide testing and certification for personnel and apparatus; and
5. coordinate fire services training in the state (MFSTS, 2003).

Fire service trainers working for MFSTS deliver training to fire fighters in their communities. The trainers provide information that is localized to meet the needs of the fire fighters and their communities. The community-based nature of this form of educational program delivery is consistent with the mission of the MFSTS hosting

agency, Montana State University Extension Service. The mission of the Montana State University Extension Service is "... an educational resource dedicated to improving the quality of people's lives by providing research based knowledge to strengthen the social, economic, and environmental well-being of families, communities and agricultural enterprises" (MSU Extension, 2003, para 1).

There is a mandate by statute and mission for the Montana Fire Services Training School to provide training for the professional development of fire fighters in Montana. Effectively meeting that charge was based, in part, on understanding what learning methods fire fighters find most useful.

The Work of Fire Fighters

Fire fighters in Montana face many challenges. They face familiar hazards such as fires in homes and businesses and new challenges such as responding to clandestine methamphetamine manufacturing labs, criminal and terrorist incidents, and fires in the forests that threaten to destroy homes. Meeting those operational challenges requires that fire fighters engage in continual learning.

As first responders to emergencies, fire fighters face life threatening, unforgiving, and dynamic hazards and challenges. Fire fighters are successful in providing first response to emergency situations to the extent they know their business, are serious about delivering their services, and arrive at the emergency inclined to aggressively deliver their services. Fire departments must quickly assemble a set of highly skilled workers who will work inside a plan. The work they do is fundamental to handle emergencies effecting people, property, or the environment. That interruption frequently involves

physically placing their bodies between their customer and what is trying to kill or harm that individual. The intervention services must be delivered by the manual labor of fire fighters. The work of a fire fighter takes place in working conditions that include compressed time frames, severe consequences for their customers and themselves, poor or nonexistent information about exactly what the parameters of the emergency are, and an environment where everyone is stressed. Compounding these challenging working conditions are the constantly evolving hazards fire fighters face.

In order for fire fighters to safely deliver first response emergency services, they must understand the hazards facing their communities and the strategies and tactics they can use to address those hazards. With changes in our world's technologies and social relationships come changes in the hazards faced by fire fighters. Responding effectively requires that fire fighters remain current in all aspects of their work. Staying abreast of all the hazards facing fire fighters is a constant fixture of their work throughout their tenure. Fire fighters must learn to survive.

Learning is part of the work of a fire fighter. The learning undertaken by a fire fighter is continual, diverse, and application driven. Fire fighters share many of the characteristics of classic adult learners. They must find the most up to date knowledge about the challenges currently faced. They must also develop skills and abilities that allow them to safely and aggressively deliver service. Every response provides an opportunity for learning as well. While experience is an invaluable teacher, there is great risk in using that source alone. Emergencies frequently give the test right before the lesson. That sequence of tests and learning can have fatal outcomes for responders and their customers. Fire fighters must combine experience with reflection and proactive

learning in order to survive and provide quality service. Fire fighter training and practice is the core of the proactive development of their skills and abilities.

Demand for emergency services approximates the population of an area. Generally, the greater the demand for service, the higher the need for diverse experiences of the responders delivering the services. Emerging hazards create especially dangerous conditions because responding fire fighters may find themselves in a situation they do not understand. In these situations, emergency responders are faced with the challenge of relatively infrequent (and in some cases, first time) responses and the resulting lack of experience. With limited response experience, first-hand learning opportunities based on actual experience are minimal.

Best Practices in Fire Services

Many fire fighter fatalities are preventable by the implementation of practices that are standard to the fire service. In the United States Fire Administration Fire Fighter Retrospective Study it is stated that, "some circumstances that lead to the death of fire fighters are simply beyond human control. Generally, however, most fire fighter fatalities are the result of a chain of events, which, if detected early, has the potential to be broken and prevent many, or even most, fatalities" (USFA, 2002, p. 3).

Fire service best practices are applicable across many fire departments. In the United States Fire Administration study, A Fire Service Needs Assessment, the general applicability of fire service best practices is stated

> In any community, fire burns the same way in the open or in enclosed spaces. Fire harms people and property in the same ways. And the resources and best practices required safely addressing the fire problem–or any other major

emergency–tending to be the same everywhere (USFA FA-240, 2002, p. 5).

The interest in reducing the negative effects of operating in the hazardous environments where fire fighters work is international in scope. Robeson (1999) asserts a similar perspective on the nature of circumstances where fire fighters are injured or killed. He states, "Almost no accidents happen when people take a calculated risk. They almost always occur when they are overtaken by a risk that was not calculated, or perhaps even foreseen" (p. 1).

Fire fighters can operate more safely if they know what to do and manage the execution of that knowledge. Robeson (1999) further supports the manageability of fire fighting by stating

> Safety is mostly the result of good management systems. If it's sensibly and creatively managed, then not only its safety, but its quality and productivity flow naturally. If its management systems are flawed, muddled, or driven by dysfunctional agendas, then poor outcomes, including accidents, can almost be inevitable (p. 2).

Fire fighters can learn to operate safely and prevent poor outcomes including accidents. Some of the strategies useful in causing high quality operations to happen include improving the knowledge, ability and skill base of fire fighters. Describing the process of preventing accidents, Robeson (1999) states "the key to it all is opening up the flow of relevant, meaningful information to and from fire fighters" (p. 4).

In planning for the future reduction of accidents resulting in fire fighter injury and death, Robeson (1999) suggests several strategies that include:

> I believe it is possible to radically reduce the frequency and severity of fire fighter accidents. I believe the future of reducing fire fighter accidents lies in doing the following things: Develop lots of members to be 'safety savvy' at the brigade level. This can be done through workshops covering how accidents really occur, the beliefs, errors and interactions that lead to them, and how they can be

> investigated and prevented. Feedback that sorts information to all fire fighters in a way that is readily available and easily understood (p. 5).

The strategies Robeson (1999) suggests are available today to fire fighters in Montana. But are they configured in useful ways? Are they available in a venue, at a time and place, or in a medium that is accessible to fire fighters? What are the most effective methods by which fire service trainers can address the needs of fire fighters in Montana who are recognized as using best practices? These questions have not been answered.

Best practices are found in many places. In 1999, the Office of the Legislative Auditor in the State of Minnesota published a report describing the best practices of the fire service. The report identifies five goals for the effective and efficient management of fire services.

The goals outlined in the report include:

1. To prevent the outbreak of fires and achieve fire safety awareness throughout the community.
2. To ensure the enforcement of fire and life safety codes for the prevention and control of structure fires.
3. To investigate the cause, origin, and circumstances of fires in the jurisdiction.
4. To maintain a response capability that is safe and effective.
5. To protect citizens' life safety and property against the dangers of fire and other emergencies that may occur in the response area (1999, p. 32).

The report goes on to identify seven actions that were recommended to meet the five goals listed above. These are:

1. Assess risk and develop long-range plans.
2. Evaluate fire department performance and use resources cost effectively.
3. Promote public awareness of fire safety.
4. Ensure fire code enforcement.
5. Develop effective communications systems.
6. Prepare a competent work force and support safe operations.
7. Plan for on-scene operations (1999, p. 32).

Two more aspects of the report focus on preparation of a safe and competent workforce and conducting safe incident operations. These actions were selected due to the critical relationship between routine performance of these actions and the prevention of fire fighter fatalities (USFA FA-220, 2002). These actions are best practices for the fire service in Minnesota and in Montana.

The purpose of the Montana Fire Services Training School includes "provide fire service personnel with professional training; identify new methods of fire prevention and suppression and disseminate information about them" (MCA, 20-31-103. (1) and (2) Purpose of school). It is the role of the MFSTS to identify the best practices of the fire service and bring that information to fire fighters in Montana.

Problem Statement

Many fire fighter fatalities and injuries are preventable. By implementing prevention programs (including training), fire fighters who have learned the lessons offered by the death or injury of other fire fighters may avoid similar occurrences. While it is essential that fire fighters participate in continuous learning activities, little is known about what learning actions fire fighters in Montana take to learn about effective methods and innovations. The learning sources used by fire fighters recognized as using best practices are not identified nor, necessarily, are they well understood.

Identifying and understanding what learning actions are taken by fire fighters and what learning sources those fire fighters use to address effective methods or innovations is important in the development of the content and delivery mechanisms for fire service training in Montana. Furthermore, with training content and organization closely

matching the learning actions used by the fire fighter, future fire fighter training opportunities will be more effective in helping fire fighters perform their work.

Research conducted in the area of firefighter learning actions is very limited. Database searches in ERIC, Dissertation Abstracts, Federal Emergency Management Agency (FEMA), ASTD, and Google using key words and phrases such as fire fighter learning methods, first responder learning methods, and fire fighter learning techniques have revealed no related research. In order for Montana fire service adult educators to aid the firefighter in his/her pursuit of knowledge and skills, answers to what constitute best practices must be determined.

Purpose of the Study

The purpose of this study was to identify and describe the learning actions and learning sources used by a selected group of fire fighters in Montana who are recognized as using best practices in preparing a safe and competent workforce.

Research Questions

The research questions to be answered in this study were:

1. Where do fire fighters, who are recognized as using best practices in preparing a safe and competent workforce, first receive information regarding effective methods or innovations?
2. What sources are used most by fire fighters, who are recognized as using best practices in preparing a safe and competent workforce, to obtain information about effective methods and innovations?

3. What information source is most relevant to the needs of fire fighters who are recognized as using best practices in preparing a safe and competent workforce?
4. What learning actions are taken by fire fighters who are recognized as using best practices in preparing a safe and competent workforce?

Study Significance

The study was significant in that it provided new insight into the professional development learning practices of fire fighters recognized as using best practices in preparing a safe and competent workforce. The descriptions of what learning actions were effective for fire fighters help adult educators providing fire service training build effective education outreach mechanisms that match the learning actions of their clientele.

This study provided an opportunity to discover, describe, and understand the connection between proven learning actions used by fire fighters and adult education outreach services provided for those fire fighters. The information provides a foundation for the planning and evaluation of effective adult education service delivery to fire fighters in Montana.

The study contributed to the body of knowledge in the fields of adult education in general and offered an in-depth description of how a group of adults learns. Because there has been little research regarding learning actions used by fire fighters, fire service adult educators benefit from this study because they became aware of the means by which to effectively deliver education programs to fire fighters. There is much research regarding learning among adults, but little that focuses on fire fighters.

Fire fighters benefit from the results of this study because of increased awareness of actions and sources for learning effective methods, innovations, skills and knowledge. Many of the effective methods, innovations, skills and knowledge are readily identified in the study of the fire fighters. The lessons learned by fire fighters following a fire fighter fatality or injury are particularly valuable as they often identify causal factors in the death or injury. The application of effective methods, innovations, skills, and knowledge adapted from the lessons learned from fire fighter fatalities and injuries adds to the safety of fire fighters and the customers they serve. Gathering lessons learned from fire fighter fatalities and injuries allows fire service adult educators to offer current relevant information to other fire fighters.

Fire fighters' lives depend on their ability to know, and correctly respond to, the hazards they face. They are at great risk when their ability to address a hazard, particularly an emerging hazard, follows being exposed to the hazard. The greatest risk fire fighters face is when their work provides them with a test of their ability right before they learn the lesson needed to face the hazard. When experience is limited, proactive, real world training and practice are essential to the provision of safe, high quality services. Fire fighters, and especially those operating in rural and frontier areas, need relevant, valid, proactive training and practice. They need that training and practice as soon as possible.

Finally, because fire fighters gained new information about how to learn about the established and emerging hazards facing their customers, the citizens in our neighborhoods and communities benefit. Improved fire fighter performance results in improved customer service.

Definition of Terms

For the purpose of this study, the following terms were defined.

Adult: A mature person who has taken responsibility for his or her own decisions and actions.

Adult learner: Any adult who engages in some type of activity, formal or informal, in the acquisition of knowledge or skill in an examination of personal attitudes or in the mastery of behavior (Hiemstra, 1976).

Artifact: A characteristic product of human activity (Webster's Ninth New Collegiate Dictionary, 1985, p. 105).

Best practices: Activity within a field that is considered by various persons knowledgeable in that field as being the most effective way to respond to a given situation.

Fire Fighter: A person engaged in providing services through a fire service organization.

Fire Service adult educator: A person who engages in providing training opportunities to fire fighters.

Learning actions: The learner activity between the time a learner becomes motivated to learn and implementation of what the learner learned. It is the activity focused toward learning objectives.

Self-directed learning: In its broadest sense, self-directed learning describes a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating goals, identifying human and material

resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes (Knowles, 1975).

Assumptions, Delimitations and Limitations

There are several assumptions regarding the design of this study. Included are:

1. Adults, including fire fighters, are engaged in lifelong learning.
2. A fire fighter must stay abreast of the field through a process of learning.
3. There are many methods of learning. Some are traditional, classroom-based; others are more self-directed.
4. Qualitative research can be descriptive. Data collected in the form of words, artifacts, and pictures are as valuable as statistical research.
5. Qualitative researchers are concerned with the processes of the research as well as the outcomes and products.
6. Fire fighters recognized as using best practices in preparing a safe and competent workforce and conducting safe incident operations are involved in learning as much or more than those fire fighters not using best practices.
7. Fire fighters who take learning actions to implement and employ best practices are assumed to be sufficiently motivated to learn.

Methodology

The researcher used a qualitative methodology for this study, as it was the most effective way to discover and describe by what methods fire fighters, recognized as using best practices in preparing a safe and competent workforce and conducting safe incident

operations, learn. The setting for the study was in the natural context of the participating fire fighters. The framework of the study emerged during the study. All of these characteristics of the study support the selection of a qualitative research methodology (Guba, 1978). Guba and Lincoln (1989, p. 159) cite the work of Mary Lee Smith describing qualitative research "as the long term and first hand study of a case by the investigator for the purpose of understanding and describing human action in the context of that case." Field methods were used to collect data, including direct observation of action in its natural context, clinical interviews to elicit the multiple meanings of participants in that case and the collection of documents. A qualitative approach leads to reports primarily in the form of words, pictures, and displays rather than formal models or statistical findings.

The researcher used a select group of Montana fire fighters recognized as using best practices in preparing a safe and competent workforce and conducting safe incident operations. The Director and staff of Fire Services Training for Montana and the members of the Advisory Council for MSU ES Fire Services Training School selected the study group members. The initial group started with 19. The data collection methods included interviews addressing the research questions, recordings (audio and video), site visits, the study of artifacts and records, and a Rating of Sources Instrument. Demographic information was collected on all study participants. Data analysis included the recognition and description of the actions by which fire fighters–those recognized as using best practices in preparing a safe and competent workforce and conducting safe incident operations–go about learning new skills and knowledge. Data was presented via tables. A frequency count was used to determine the relevance of frequency use for

learning sources and actions.

Summary

Adults face a lifelong, ever changing world and a resulting need for lifelong learning. Fire fighters are adult learners who face a high consequence learning process. If fire fighters are successful in their learning, they perform safely and effectively. If they fail to learn, they face enormous risks including injury or death. Fire fighters must learn to survive.

Many of the hazards effecting communities and their fire fighters are known. Some are new hazards, such as the terrorist attacks on and after September 11, 2001. Fire fighters must learn about these hazards in order to provide safe effective emergency services to their communities.

In order to effectively reach fire fighters with new skills and knowledge, fire service educators must understand how fire fighters go about gaining new skills and knowledge. To understand the learning strategies used by fire fighters, this research sought to discover and describe how fire fighters who are recognized for using best practices in preparing a safe and competent workforce and conduct safe incident operations go about gaining new skills and knowledge.

Selected fire fighters who are recognized as using best practices are the most active learners and were, therefore, the subjects of this research. The research methodology included field interviews with the selected population of fire fighters. The interviews were video- and audio-taped to gather data. The researcher made field observations of the activities, records, and programs of the fire fighters and their

organizations and communities. The researcher studied and recorded (still and video) artifacts that demonstrate the use of best practices. Data was analyzed in the effort to discover patterns of learning actions. Study participants completed a survey that gathered demographic information and allowed for the identification of the frequency of use for learning actions and sources.

CHAPTER 2

REVIEW OF THE LITERATURE

The purpose of this study was to identify and describe the learning actions and learning sources used by a selected group of fire fighters in Montana who are recognized as using best practices in preparing a safe and competent workforce. The literature review includes fire problems in the United States and Montana, identification of the background of community and volunteer fire fighters, fire fighter hazards, fire fighter fatalities, fire fighter best practices, fire training in Montana, and adults as learners.

Fire Problems in the United States and Montana

The scope of the fire problem in the United States and in Montana is well documented. The 12th edition of Fire in the United States, 1989-1998 describes the fire problem in a variety of metrics.

> Fire departments in the United States respond to an average of 2 million fire calls each year. This fire problem, on a per capita basis, is one of the worst in the industrialized world. Thousands of Americans die each year, tens of thousands of people are injured, and property losses reach billions of dollars. There are huge indirect costs of fire as well - temporary lodging, lost business, medical expenses, psychological damage, pets killed, and others. To put this in context, the annual loss from floods, hurricanes, tornadoes, and earthquakes, and other natural disasters combined in the United States average just a fraction of the casualties from fire (USFA, 2002, p. 1).

Fire fighters perform dangerous work. "Nationally, between 1990 and 2000, 1,085 fire fighters lost their lives while on duty" (USFA, 2002, p. 13). While some fire

fighter deaths are the results of circumstances beyond human control, many of the fire fighter deaths are preventable. As stated in the Fire Fighter Fatality Retrospective Study, 1990-2000,

> ...through research, training, improved operations, development of new technologies, the appropriate use of staffing, and other factors, it should be possible to significantly reduce the number of fire fighters killed each year. Moreover, fire fighter fatalities are generally the result of a chain of events, which, if detected early, may be broken to prevent many or even most fatalities (USFA, p. 41).

According to the report, Fire in the United States, 12th edition, the general fire problem in the United States is particularly significant in Montana. Montana has a fire death rate per population that is the sixth highest in the nation. "The national fire death rate per million population for the period 1989-1998 was 14.9. The state fire death rate per million in Montana was 25" (USFA, 2002, p. 35).

According to the Federal Emergency Management System, the United States Fire Administration has set a goal of reducing the fire fighter deaths by 25% by 2005. New methods of fire prevention and suppression are sometimes the result of lessons learned from current, sometimes unsuccessful fire fighting methods. A key to reducing fire fighter deaths is sharing successes and failures of current and new fire fighting practices. In Montana, one organization addressing the need to reduce fire fighter deaths is the Montana Fire Services Training School, which is part of Montana State University's Extension Service. The purpose of the Montana Fire Services Training School (MFSTS) includes disseminating information regarding professional training and new methods of fire prevention and suppression to fire fighters.

The hazards faced by fire fighters in the delivery of the services they provide are as diverse as the duties they perform. Fighting fires in structures exposes fire fighters to the risk of entrapment from the collapse of a building. Responding to traffic collisions on roadways exposes fire fighters to the risk of being hit by other motorists while they attempt to render aid to those entrapped in the initial collision. Fire fighters responding to incidents involving the release of a hazardous product are at risk of ingestion of the products being released. In every aspect of the stressful service they provide, fire fighters are at risk of stress-related medical problems including heart attacks.

Fire fighters must know a lot about many complex and emerging hazards. They need to learn new knowledge and skills in a proactive manner before they encounter the hazard during an emergency. Fire fighters today are involved in the process of lifelong learning. Circumstances such as the terrorist attacks of September 11, 2001 and the aftermath highlight the diverse and emerging challenges that face fire fighters. Present and future fire fighters will face repeated adaptations to change, which require lifelong efforts to stay informed about the challenges facing communities and their fire departments. Fire fighters do overcome barriers and obstacles to participate in learning and opt for increasing present knowledge, gaining new skills, and promoting change in their professional capabilities which result in increased capabilities for fire departments to respond to emergency situations.

As community needs change and demand increases, people providing essential public safety services must change and adapt to remain current in their ability to deliver meaningful services. Remaining current in the ability to deliver services requires continual learning on the part of the service providers. "Change is now so great and so

far reaching that no amount of education during youth can prepare adults to meet the demands that will be made on them" (Cross, 1984, p. 2).

As important as the content of a learning process is, aligning it with the learning actions preferred by the adult learner is a critical component of the successful learning process. Fire fighters are adult learners whose work includes learning throughout their service. Fire fighters learn in practical terms by successfully navigating through unknown situations using previously acquired skills and abilities. This work-related experience is key to their ability to adapt to changing work demands.

In an environment offering limited experience, training and practice take on a significant role in helping fire fighters learn to deliver services. That learning may include case studies, lessons learned, forecasting, application of best practices in simulated real world situations, and a solid grounding in the fundamental skills of service delivery. These many and varied learning opportunities occur in many situations. As Brookfield (1986) has indicated, learning for adults is accomplished through a wide variety of formats and methods.

Background of Fire Service Organizations and Fire Fighters

According to A Fire Service Needs Assessment of the U.S. Fire Service (USFA 2002), there are 26,354 fire departments in the United States. There are an estimated 1,088,950 fire fighters serving in these departments. The Montana Fire Services Training School estimates that there are approximately 10,000 fire fighters in Montana. Of those, approximately 9,600 are volunteer fire fighters. The rest are paid professional fire

fighters who serve their communities. In total, there are approximately 380 fire organizations in Montana that provide fire protection services.

Fire service organizations providing fire protection services in Montana are organized in several ways. Cities and towns have fire departments that are part of the local governmental structure. Areas outside cities and towns may have organized fire protection structured in several ways. Rural fire districts and fire service areas are political subdivisions that provide fire protection services to residents within an identified area. Some areas of the state have fire protection provided by non-profit fire companies operating by donations or the collection of subscription fees. These non-profit fire companies provide a public safety service to a population. Lastly, there are several private fire service organizations in Montana that provide fire protection services to specific properties or populations. These private fire service organizations vary from well known to unknown and as such provide levels of service that are similarly varied. The Exxon Oil Refinery in Billings, Montana has its own private fire fighting capability. It is specific to their petrochemical hazards and their facility. Some Montana ranches have fire suppression capability specific to the hazards they face on the ranch, more specifically range fires.

Nationally it is estimated that 233,000 fire fighters, most volunteers serving in communities with less than 2,500 residents, are involved in structural fire fighting but lack formal training in those duties. Furthermore, the needs assessment reports that an estimated 40% of fire department personnel involved in hazardous materials response lack formal training in those duties. Most of them serve in the small communities.

Additionally, 41% of the fire departments involved in wildland fire fighting lack formal training in those duties (USFA, 2002).

There are no statutory training requirements for fire fighters in Montana. However, there are several regulatory requirements for training at the state and federal levels that encompass fire fighters in Montana. These requirements are applicable only when a fire department provides the service to which the training requirement applies. There is an additional training-related interest effecting fire fighters who serve their communities as volunteers. The training interest is a requirement of the volunteer fire fighters' retirement program administered by the State of Montana Public Employee Retirement Division. That requirement is for 30 hours of training each year. The requirement applies only if the fire fighter wishes to earn one year of credit toward the 20 years required to earn a modest pension.

Fire Fighter Fatalities

According to the Firefighter Fatality Retrospective Study 1990-2000, 1,085 fire fighters died in the line of duty during this period (USFA, 2002). The types of incidents in which there were fatalities are shown in Figure 1. The three most common types of incidents resulting in fire fighter fatalities, structure fires, wildland fire, and motor vehicle crashes comprise approximately 75% of all incident types where a fire fighter fatality occurred. Structure fires, wildland fires, and motor vehicle crashes are all incidents that are common to fire protection service delivery in Montana.

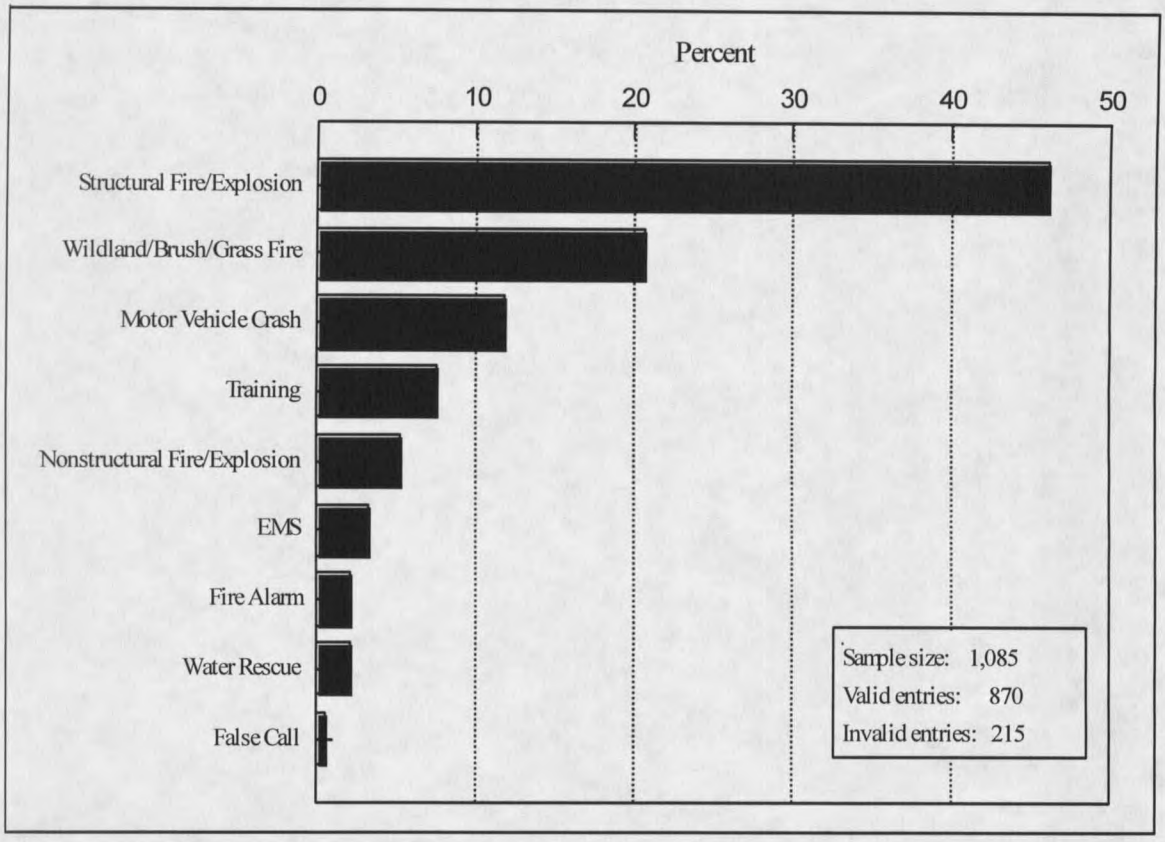


Figure 1. Types of Incidents Resulting in Fatalities (1990-2000) (USFA, 2002, p. 14)

The data in Figure 2 shows the type of duty in which there were fire fighter fatalities. The three leading duties at the time of injury were extinguishing fire/neutralizing the incident, responding to the scene, and suppression support. The three leading types of duty being performed when a fire fighter fatality occurred comprise 60% of all incidents where a fire fighter fatality occurred. The duties of extinguishing fires, responding or traveling en route to an incident, and suppression support are all duties common to fire fighters operating in Montana.

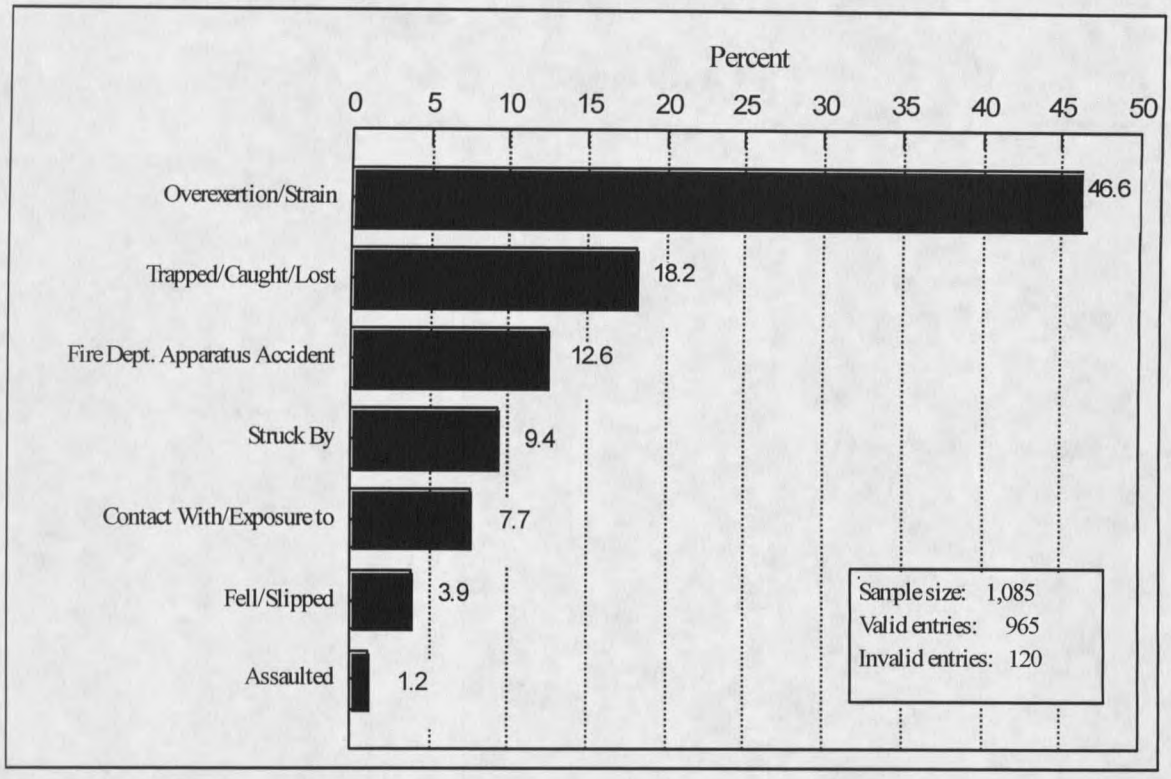


Figure 2. Type of Duty at Time of Fatal Injury (1990-2000) (USFA, 2002, p. 20)

The data in Figure 3 shows the immediate cause of the fatal injury to a fire fighter during an incident where a fire fighter fatality occurred. The three leading duties at the time of injury were extinguishing fire/neutralizing the incident, responding to the scene, and suppression support. These three immediate causes account for approximately 76% of all fire fighter fatalities. All of the immediate causes of fatal injuries to fire fighters are relevant to fire fighters in Montana because the work performed by fire fighters is consistent across state boundaries.

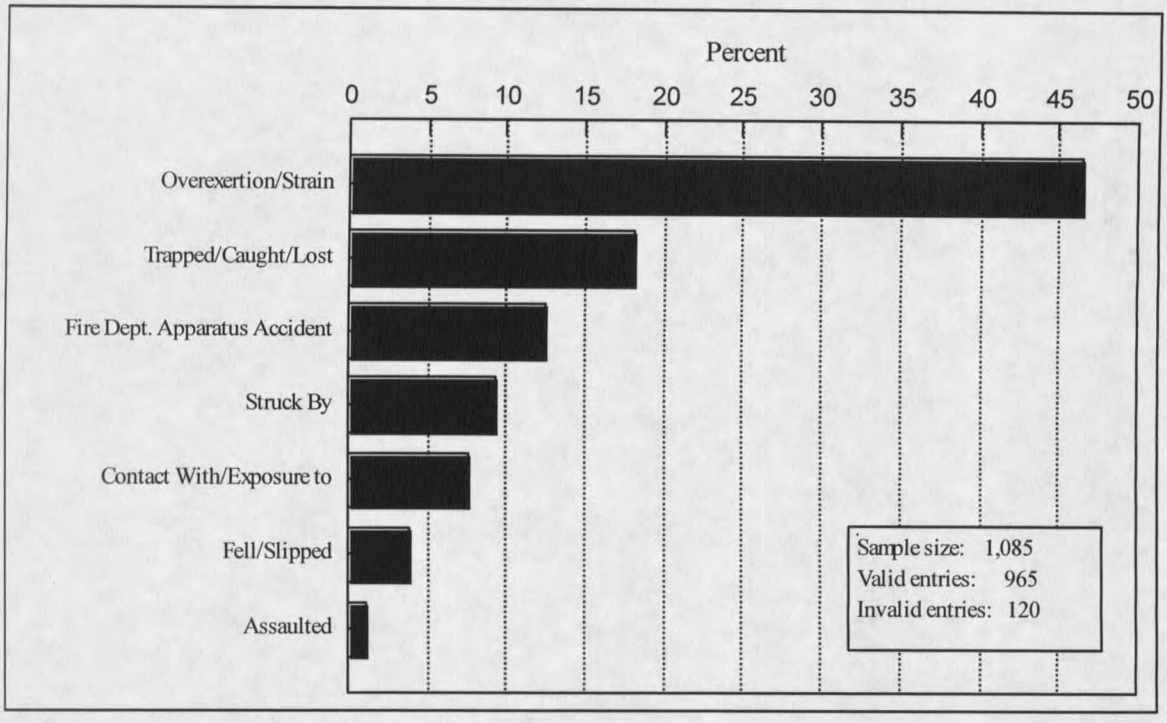


Figure 3. Immediate Causes of Injury During Fire Fighting Incidents (USFA, 2002, p.23)

The data in Figure 4 shows the nature of the fatal injury sustained by fire fighters who died in the line of duty. The three most common injuries were cardiac arrest, trauma, and asphyxiation. Together, these three injuries account for approximately 81% of the injuries resulting in fire fighter fatalities. The nature of the three most common fatal injuries is relevant to Montana fire fighters as the work of fire fighters is the same regardless where in the United States the fire is located.

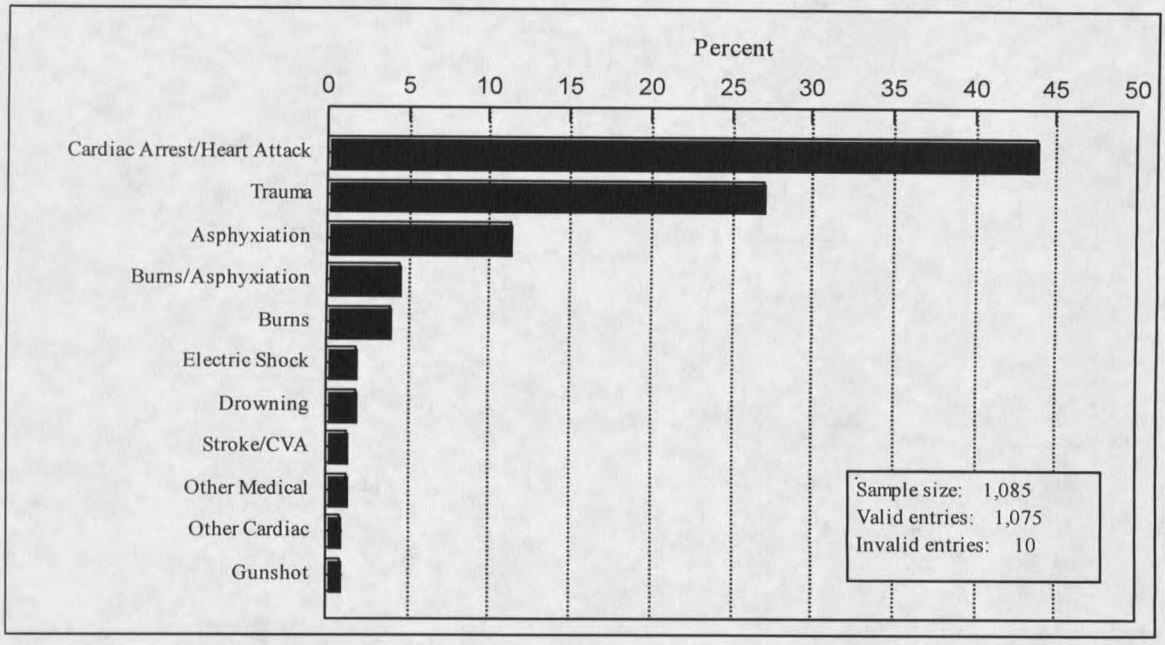


Figure 4: Nature of the Fatal Injuries (USFA, 2002, p. 24)

Fire fighter injuries and deaths cross demographic boundaries. Incident types are common in all states. Also common are the causes of the injuries and fatalities, as are the prevention strategies for reducing fire fighter deaths and injuries. As stated in the Fire Fighter Fatality Retrospective Study, 1990-2000, "By determining key factors responsible for fire fighter fatalities in any state, specific prevention programs could be delivered to specifically address and correct identified problems or trends" (USFA, 2002, p. 37).

Reducing Fire Fighter Fatalities

In the Fire Fighter Fatality Retrospective Study, 1990-2000, opportunities to reduce the number and severity of fire fighter death and injury are identified. The report addresses the challenge for the future in reducing firefighting injuries and deaths when it

states, "Through the lessons learned from their passing, it is hoped that future lives will be saved" (USFA, 2002, p. vii).

Fire fighter fatalities are the result of a standard set of conditions causing a standard, if unpleasant, outcome. The perspective of prevention through active programmatic implementation is presented in the Fire Fighter Fatality Retrospective Study, 1990-2000 as follows:

> Ultimately, some forces and circumstances that lead to firefighter fatalities are simply beyond human control. However, through research, study, training, improved operations, development of new technologies, the appropriate use of staffing, and other factors, it should be possible to significantly reduce the number of firefighters killed each year (USFA, 2002, p. 1).

By looking at the factors present at the time of the fatality incident, more can be understood about how to prevent similar outcomes in the future. As stated in the Fire Fighter Fatality Retrospective Study, 1990-2000, "Generally, however, most firefighter fatalities are the result of a chain of events, which, if detected early, has the potential to be broken and prevent many, or even most, fatalities" (USFA, 2002, p. 3). With a greater understanding of the critical factors at an incident that effect fire fighter safety, there are opportunities to reduce future fire fighter deaths.

The fire services organization has become more aware of fire fighter injuries, deaths, and general fire fighter safety. The Fire Fighter Fatality Retrospective Study, 1990-2000 states, "a growing awareness of the continued level of fatalities has changed the fabric of the fire service and prompted many fire departments and fire service organizations to initiate programs to protect firefighters" (USFA, 2002, p. 5).

Fire fighter training addresses the need for safe incident operations. This is illustrated in the Fire Fighter Fatality Retrospective Study, 1990-2000 with the specific identification of several initiatives to prevent future fire fighter deaths, "Similarly, training program improvements, the development of health and wellness initiatives, and the use of Rapid Intervention Teams (RIT) may also affect future trends in firefighter injuries and deaths" (USFA, 2002, p. 6).

Training is recognized in the broader work world as a means of reducing occupational injury and death. Schamadan identifies the important role of training in reducing injury and death when he states, "But experience in a variety of occupational settings shows that workers who are healthy and fit, who are alert, contented and trained, have lower accident rates and less-severe injuries than workers who are not" (2002, p. 336). He recognizes that training, both initial and ongoing or in-service, are critical components of effective occupational safety. He goes on to state:

> Safety is a learned behavior; people are not genetically either safe or unsafe. ... From a practical standpoint, therefore, safety training, or safety learning, is a career-long effort that covers both on-the-job and off-the-job situations. Hence all training programs must include safety as part of the curriculum (Schamadan, 2002, p. 336).

There is a clear connection between effective training and the safety of fire fighters. The lessons learned from previous fire fighter injuries and fatalities are an important part of shaping the future training program goals. Lessons learned offer an objective recording of what worked and what did not work at a particular incident. Training programs can be developed using strategies to avoid those practices that did not work and reinforcing those practices that were effective.

Best Practice

Fire departments offer a time and action critical service to their communities. To be effective in a critical service delivery setting, fire departments must operate from a sound basis. The foundation of an effective critical service delivery capability is the organization's approach to protecting the members of the organization. Cote suggests that "Protecting the community and protecting themselves are dual responsibilities of a fire department, and both are more likely when planning and preparation are fully used" (2003, pp. 2-31).

Fire department members are a critical organizational asset. Protecting the fire fighting members of an organization can be accomplished in many ways. The Fire Fighter Fatality Retrospective Study 1990-2000 states that "Ultimately, through research, study, training, improved operations, development of new technologies, the appropriate use of staffing, and other factors, it should be possible to substantially reduce the number of fire fighters killed each year" (2002, p. 6). The application of these actions through a variety of means amounts to the best practices an organization can use to protect its members and the citizens they serve.

The Best Practices for Fire Services study published in 1999 and produced by the State of Minnesota identified five primary goals for the effective and efficient management of fire services. The five goals include:

1. Prevent the outbreak of fires and achieve fire safety awareness throughout the community;
2. To ensure the enforcement of fire and life safety codes for the prevention and control of structure fires;
3. To investigate the cause, origin, and circumstances of fires in the jurisdiction;
4. To maintain a response capability that is safe and effective;

5. To protect citizens' life safety and property against the dangers of fire and other emergencies that may occur in the response area (pp. 31-32).

The Minnesota Fire Services Best Practices Study went on to identify actions and best practices to meet the five goals. The seven actions are:

1. Assess risks and develop long range plans;
2. Evaluate fire department performance and use resource cost effectively;
3. Promote public awareness of fire safety;
4. Ensure fire code enforcement;
5. Develop effective communications systems;
6. Prepare a competent work force and support safe operations; and,
7. Plan for on-scene responses (1999, p. 32).

Clearly, the best practices review of fire services in Minnesota identified a safe competent workforce as a best practices action for fire departments. As stated in the study, "Given the variety of demands for emergency assistance, most fire departments require a workforce with a broad range of skills and expertise" (1999, p. 79). Training is a direct means of preparing a safe and competent workforce.

Additional specific information regarding state of the art fire fighter safety initiatives is found in the National Fire Protection Association (NFPA) Standards. Specifically, best practices in fire service operations include fire fighter safety. Fire service safety is broadly defined in the NFPA Standard 1500, Occupational Health and Safety for Fire Department Operations.

The NFPA is a consensus standards-making membership organization. Foley and Brodoff best described the organization in the following manner:

> The National Fire Protection Association (NFPA), founded in 1895 and based in Quincy, Massachusetts, is an international consensus standards making organization accredited by ANSI (Its documents carry the ANSI standard).

> NFPA standards address issues affecting fire protection, fire prevention, public fire safety education, and fire suppression, and the fire service has always taken an active interest in their use, adoption, and enforcement. Typically NFPA standards are revised every three to five years. The revision process contains two public review processes, when the public may submit proposals and comments on an existing document or on revisions to an existing document (2002, p. 40).

Forsman identifies NFPA standards as an important part of establishing best practices when he states, "The NFPA has developed and published a large number of performance based standards for the fire service. These standards are widely recognized as the 'standard of care'" (2002, pp. 7-234).

The NFPA 1500 standard is recognized as a significant contributor to improving the awareness and action of fire fighters in improving fire fighter health and safety. Foley and Brodoff (2002) state:

> Development of NFPA 1500 began on the early 1980's, when a contingent of fire service leaders and experts in the field of occupational safety and health began developing documents whose effect would be to reduce the number of fire fighter fatalities and injuries. The original goals of that group are still intact today, as committee members, using NFPA and other major fire service organizations' data, continue to strive toward reducing those numbers (p. 402).

They (Foley & Brodoff) further state that

> By 1997, when the third edition of the document was published, the number of fire fighter fatalities and injuries had dropped dramatically. This steady drop was due partly to safety consciousness on the part of fire service personnel, whose level of awareness of how to work safely in a dangerous environment was raised by NFPA 1500 (2002, p. 402).

Foley adds further to the value of NFPA 1500 as a best practice when he states "Since 1987, most fire service personnel and allied professionals have referred to NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, as either

the 'safety bible' or as an 'umbrella document' that outlines all the components of a fire service occupational safety and health program" (2003, pp. 7-73).

The NFPA 1500 standard identifies significant training requirements for fire fighters. Forsman connects fire fighter safety to training when he states: "Within the general training requirements of NFPA 1500, the fire department must provide training and education to its members. This training assures that members are able to perform the duties they are assigned in a safe manner so that they do not pose a hazard to themselves or to other department members" (2002, p. 7-228).

Forsman (2002) identifies training as a benchmark in the operation of a fire department. He states:

> Training is a challenge for nearly every organization, including fire and emergency services. It is a sign of the commitment of that organization to provide quality service and to ensure the health and safety of their employees (career, paid on call, or volunteer). The fire and emergency services have a lengthy history of delivering quality training and, in the process, of being innovative (2002, pp. 7-225).

Fire fighter training and fire fighter safety are directly connected.

> Safety must be at the center of all training and education and is arguably the reason why many training classes exist. The fire and emergency services, particularly in North America, have amassed a dismal record of on duty deaths and injuries, which certainly justifies stronger efforts on training, notwithstanding the substantial improvement of the last quarter of the twentieth century. However, the last two decades of the twentieth century found the service focused on ensuring that fire fighters had a better chance of surviving and living a long and healthy life (Forsman, 2002, pp. 7-226).

Effective training meets the needs of the organization and the participants. In order to offer an effective fire fighter training program, all facets of the organization's membership should be offered the opportunity to feed into the direction of a training

program. Forsman (2002) supports member involvement when he states, "A fire department's ongoing training program should be carefully planned, evaluated, and revised as needed. Personnel from all levels of the department should be included in this process so that their particular needs and concerns are not overlooked" (pp. 7-228).

Identifying fire fighter operational needs is critical to the success of a training program. Operational needs can be determined by asking fire fighters what worked and what did not work at incidents. Forsman states:

> An important part of the ongoing planning process is customer feedback. In the case of training, the customers are the citizens of the community, the leadership of the fire department, and the individuals being trained. The collective feedback from all these customers will help the planning team determine the training's effectiveness, correctness of direction, errors in priorities, and new initiatives (2002, p. 7-233).

A critical part of any fire fighter safety and training program is the study of actual incidents. Important information about actual conditions fire fighters operate in and the resulting effects of their fire fighting actions can come to light when fire fighters study what took place at actual incidents. Forsman describes the process of learning from actual incidents by stating:

> The post-incident analysis should be conducted in a structured, nonthreatening manner that allows for a free exchange of information and honest evaluation. The process should look at the performance of the department at a given incident in relationship to customer service and safety as well as all department goals and objectives. The scene of a significant departmental operation is the most realistic training venue of all. If an organization fails to capitalize on this teaching/learning experience, it has missed a training opportunity (2002, pp. 7-230).

Another source of information regarding fire fighter safety is independent reviews of incidents by allied professionals. This source is particularly useful when the incident

resulted in the injury or death of a fire fighter. One such allied profession is occupational safety incident investigation. Foley and Brodoff describe such an allied professional agency and review process when they state:

> The National Institute for Occupational Safety and Health (NIOSH), an agency within the Centers for Disease Control and Prevention, received authorization and appropriations from Congress in 1998 to investigate all fire fighter fatalities within the United States. This investigation process includes career, volunteer, military, and federal fire fighters. As part of the investigation and reporting process, NIOSH posts its investigation reports on its Web site (www.cdc.gov/niosh/firehome/html). NIOSH is providing a valuable service in assisting the fire service in determining causes of fire fighter fatalities. The information gathered is being used to create and revise NFPA standards, educate allied professionals on the hazards of the fire fighting profession, and, most important, reduce the number of fire fighter fatalities (2002, p. 82).

In many investigations of fire fighter fatalities, NIOSH investigators reach conclusions addressing minimizing the risk of similar occurrences. A practice that results in minimizing the risk of future occurrences of causal factors leading to a fire fighter death is a strong best practice.

In the NIOSH report on an October 2001 fire fighter fatality in Texas, the investigators address matters related to fire fighter training and fire fighter safety. The investigators state, "NIOSH investigators concluded that, to minimize the risk of similar occurrences, fire departments should ensure that the department's high rise standard operating procedures (SOPs) are followed and refresher training is provided" (2001, p. 1). The NIOSH investigators cite NFPA 1500 as a reference for the investigation. Clearly, the NIOSH investigators identify training as a means to improve fire fighter safety. The NIOSH investigators identify key safety practices, best practices which if implemented by fire fighters will result in safer operations.

Fire Service Training in Montana

Fire fighter training is critical to providing quality service to our citizens. Brunacini connects fire fighter training with service delivery:

> Simply, no fire fighting happens at Mrs. Smith's on the day she has her kitchen fire, until Responder Jones shows up and goes to work (i.e. performs). The outcome out at Mrs. Smith is directly connected to the quality of the work Fire Fighter Jones performs. Good work is a function of human skill; human skill emerges from training - so, if we want our responders to do good work, we should give them good training (pretty simple, huh?). Good training (along with safety) is the most important organizational investment we can make, because when our humans are well prepared, they do a good job (2002, p. 6).

Fire service training in Montana is provided by the Montana Fire Services Training School (MFSTS), part of MSU's extension Service. The MFSTS is charged by the Montana Codes Annotated to provide best practices in fire services to fire fighters in Montana through a training delivery process. MFSTS staff provides training in many different venues and arrangements. Effective adult education for fire fighters is based, in part, on configuring fire services training to match what fire fighters need, in terms of both the content of the learning and the actions taken for the purposes of learning.

The MFSTS school staff consists of a Director, an administrative support position, a logistical and service support position and five field trainers. Five field trainer staff members and the Director are practicing fire fighters in Montana and members of various fire service professional organizations.

The directors and field trainer staff have daily contact with members of the fire service in Montana. They conduct meetings, present training programs, support local training programs, assist in local fire service operations, address local governing bodies,

develop curriculum, certify professional qualifications, and act as resources for fire fighters.

The MFSTS staff also offers onsite, e-mail and phone consultation for all of the fire fighters in Montana. It is common for the MFSTS staff to receive and process approximately 200 fire fighter contacts in a week. The MFSTS staff is in hourly contact with fire fighters in Montana. They deliver training and consultation services to fire fighters in Montana every day of the week, all year, at hours ranging from 5:30 am through 11:00 pm, at organized presentations and meetings, and through informal personal contact. These services are conducted in fire stations, on university campuses, and in the homes and businesses of fire fighters. The MFSTS school operates a lending library/resource center of books, research studies, video, film, CD and audio programs useful to fire fighters in Montana. The library provides the latest in research and information resources with over 20,000 information contacts each year. The staff also develops and distributes a daily, weekly and monthly newsletter service. The daily and weekly information services are offered via e-mail and currently deliver the latest information to over 1,000 subscribers. The monthly newsletter is in paper format and is delivered to more than 1,200 subscribers by the first of each month.

Adults as Learners

Coudron describes the long history of adults learning primarily through their experiences. She states, "Adults learning best through personal experiences is nothing new" (2000, p. 55). Adult learning is different for every adult and every situation. There are many approaches to adult education. According to Merriam and Caffarella:

> How easy it would be to explain adult education to legislators, public school personnel, educators, and the general public if we had a single theory of adult learning - a theory that differentiated adults from children, that included all types of learning, and that was at once elegant and simple. But just as there is no single theory that explains human learning in general, there is no single theory of adult learning (1991, p. 248).

By studying current and past successful and unsuccessful fire department practices, Montana fire fighters can learn how to improve their performance. The challenges facing fire fighters in Montana are less a function of a lack of information regarding successful and unsuccessful practices than a function of accessing that information. Fire fighters in Montana are, by their age and their active participation in learning, adult learners. Fire fighters in Montana engage in many adult learning activities similar to what has been documented by Brockett and Hiemstra (1991), "Each learner or group of learners will be unique, the state of knowledge regarding the subject will constantly change, and needs uncovered during the learning process will provide new information for identifying learning resources and activities" (para 13.) Furthermore, the emphasis on experience as a defining feature of adult learning helps define the context in the learning actions of fire fighters (Brookfield, 1995).

While adults each learn individually, they have some common approaches to learning. Adult learners share some common characteristics relating to how they go about learning. Although adults learn in diverse ways using different learning actions, they do, however, share some common characteristics in terms of the approaches they take to their learning. Kerka (citing Draper 1998; Sipe 2001; Tice 1997; Titmus 1999) addresses some of the common characteristics of adult learning when she states:

> Theories or perspectives on adult learning, such as andragogy, make a number of assertions about the characteristics of adults as learners: adults need learning to be

> meaningful; they are autonomous, independent, and self directed; prior experiences are a rich learning resource; their readiness to learn is associated with a transition point or a need to perform a task; their orientation is centered on problems, not content; they are intrinsically motivated; their participation in learning is voluntary (2002, p.1).

Adults who volunteer to serve their communities with a fire department participate in a variety of learning activities. "The types of learning that occur in volunteer settings cross the spectrum of adult learning. ... Problem focused organizations such as a volunteer fire department might emphasize problem solving, experiential learning, teamwork, and group process to accomplish their mission" (Kerka, 1998, p. 2).

Adult educators desiring to meet the needs of adult learners must pay attention to the personal preferences of the learner. Hiemstra (1976) states, " the concept of self, the wealth of experience, the variety of real problems, and the various reasons for learning that the adult brings to the educational setting must be reckoned with by the teacher" (p. 39).

Adults learn continually throughout their lives. There are many changing elements present that effect communities. Technology, information, and societal forces continue to affect our communities every day. Providing services to communities in a changing environment provides many challenges to those providing the services. This is especially true for fire fighters.

As communities grow and needs change, people providing essential public safety services must change and adapt to remain current in their ability to deliver meaningful services. Remaining current in the ability to deliver services requires continual learning on the part of the service providers. "Change is now so great and so far reaching that no

amount of education during youth can prepare adults to meet the demands that will be made on them" (Cross, 1984, p. 2).

Self-Directed Learning

The sum of the characteristics of learning by adults may include attributes of self-directed learning. Huey B. Long (2003) provides the following perspective on self-directed learning: "Self-directed learning is a purposive mental process, usually accompanied and supported by behavioral activities involved in the identification and searching out of information. The learner consciously accepts the responsibility to make decisions about goals and effort and is, hence, one's own learning change agent" (p. 1). Learning that is self-directed may be undertaken in many domains, in many ways.

Tough (1978) states that between 75% and 80% of all adult learning projects are self-directed (also cited by, Cross, 1984, pp. 189-190; Brookfield, 1984, p. 34). In self-directed adult learning processes, the adult learner decides what resources will be used and how they will be used (Fellenz & Seaman, 1989).

Long describes learning that is self-directed by describing the information processing skills used by adult learners. According to Long:

> From the available research it is assumed that the self-directed learner is able to attend to and process information by at least one of the following skills: Observing - the ability to see and do, or the ability to see and understand. Seeing and translating - the ability to translate visual information to notes and records, or the ability to graphically reproduce visual information and to relate it to existing information schemes. Reading - the ability to read, translate, and comprehend written material. Listening - the ability to receive and process aural information and relate it to existing information schemes (2003, p. 2).

Brookfield (1999) addresses the characteristics of self-directed learning in terms of control. Brookfield states:

> Probably the most consistently predictable element in definitions of self-direction is the importance of the adult's exercising control over the educational decisions any learning project requires. What are legitimate goals of a learning effort, how these might be accomplished, what resources will be most helpful, what methods will work best, and what criteria are most appropriately applied to judging the success of any learning effort are all decisions that are said to rest in learners' hands (1999, p. 4).

Among the abilities of adults who take self-directed learning actions is the learner's awareness of their learning processes. Long refers to this ability as self-awareness. Long describes this attribute as follows: "It enables individuals to be aware of their learning processes, of their weaknesses and strengths, to know how and what is distracting in their environment, to know the importance of a given learning activity, to know when they need assistance, to have a realistic perception of their ability to achieve their learning goal" (2003, p. 4). Self-awareness of learning processes is an attribute of adult learning that is necessary for adults to direct their learning actions.

Brockett and Hiemstra (1991) echo this by stating "Some basic assumptions underlie the notion that self-direction in learning is possible. For example, we believe that the mature adult is quite capable of assuming personal responsibility for planning and carrying out learning activities" (para 11). When supporting adult learners who are engaged in self-directed learning, teachers can be effective by taking a facilitative approach. In the role as facilitator, Brockett and Hiemstra (1991) believe there are some specific roles the facilitator needs to undertake in promoting self-direction in learning:

> ...5. Locate available resources or secure new information on topics identified through needs assessment; 6. Build a resource collection of information, media,

> and models related to a variety of topics or areas of study; 7. Arrange contacts with resource people on special topics and set up learning experiences for individuals and small groups beyond normal large group sessions (para 19).

Part of self-directed learning relates to a learner's ability to work through challenging learning circumstances. Adult learners who have peers who offer support for the learning actions and processes are able to sustain their learning actions. Brookfield echoes the value of peer learners offering support by stating:

> I think it's important that you have a peer group who are struggling with the dilemmas you're struggling with. In *The Skillful Teacher*, I emphasize the importance of community, particularly to students – that when people experience difficulty learning the thing that keeps them at it is knowing they have an emotionally-sustaining peer group they can turn to for support (1994, p. 4).

Informal Learning

Many of the types of learning actions used by fire fighters in Montana are informal. Learning in informal settings is common throughout the world of work. Livingstone (2001) supports this when he states:

> But we also continually engage in informal learning activities to acquire understanding, knowledge, or skill outside the curricula of institutions providing educational programs, courses, or workshops. Informal education or training occurs when mentors take responsibility for instructing others without sustained reference to a preestablished curriculum in more incidental or spontaneous situations, such as guiding them in learning job skills or in community development activities. Finally, all other forms of explicit or tacit learning in which we engage either individually or collectively without direct reliance on a teacher-mentor or an externally organized curriculum can be termed nontaught self-directed or collective informal learning (p. 22).

The use of informal learning is common to adults. Fire fighters participate in learning that is organized and learning that is informally developed. Livingstone stated

"Employment-related informal learning is found to be more extensive than course-based training across nearly all employment statuses and occupational groups" (2001, p. 26). Informal learning is a critical component of learning processes used by fire fighters in Montana.

Summary

Adults are learning in many different ways and are constantly seeking and processing new information. The new information they find is processed based on their past experiences and knowledge. Often, the learning actions of adults occur in places, time frames, and constructs that are not recognized as formal learning situations. Adults desire to expand their base of knowledge given the opportunity, provided the available opportunity meets their underlying need for the information.

There is a need to increase the understanding of what actions adults take in the process of learning. That need is growing as the ordinary life challenges facing adults grow in breadth and depth. The growth is challenges and the resulting need for learning is especially significant for fire fighters. Research in the area of fire fighter safety indicates that more can be done to help prepare fire fighters for the work they face. Current learning opportunities meet some of the needs of fire fighters, however many learning actions have gone unrecognized by fire service educators. In order for fire service educators to effectively provide service in support of fire fighters, more must be known about what learning actions fire fighters take.

There are approximately 1.1 million fire fighters in the United States. Approximately 10,000 of those fire fighters serve in Montana communities. Montana

fire fighters are facing numerous challenges as the demand for their services continues to grow. Research into fire fighter safety issues indicates that there are opportunities to improve the safety performance of fire fighters. The research suggests that fire fighter training is a part of the process of developing improved safety performance among fire fighters.

Fire fighters use a variety of sources to become aware of changes in service demands and gain the necessary knowledge to evaluate safe operations. Research in adult learning and fire fighter safety offers insight into adult learning processes used by fire fighters. There remains a significant difference between what is known about fire fighter safety and what is actually being put into practice.

In the review of literature, there is little information available to help fire fighters and fire service educators understand how other fire fighters gain information pertaining to preparing a safe and competent workforce. Fire fighters and fire service educators need to have this information available to them so they can take advantage of learning processes other fire fighters have used which have proven effective.

CHAPTER 3

RESEARCH METHODOLOGY

Introduction

The purpose of this study was to identify and describe the learning actions and learning sources used by a selected group of fire fighters in Montana who were recognized as using best practices in preparing a safe and competent workforce. The research used a selected group of 19 fire fighters in Montana who were recognized as using best practices in preparing a safe and competent workforce. The selection group was made up of persons knowledgeable in matters related to best practices in fire fighting and familiar with fire fighters who use best practices. The data analysis includes descriptions of learning actions and learning sources that the selected group of fire fighters used to learn. The researcher used a qualitative research method for this study.

The primary reason for selecting a qualitative research method was to address the descriptive nature of the purpose of the study. The researcher proposed to describe the learning actions and learning sources used by fire fighters using a combination of interviews based on the research questions and the study of artifacts and records used by the selected group of fire fighters. An additional reason for proposing a qualitative study was to discover patterns in the learning actions and learning sources used by fire fighters in Montana. From the findings of the study, fire fighter educational program

development and implementation might be aligned more with those learning actions and learning sources used by fire fighters in Montana.

The study sought answers to the following questions:

1. Where do fire fighters, recognized as using best practices in preparing a safe and competent workforce, first receive information regarding effective methods or innovations?
2. What learning sources are used most by fire fighters, recognized as using best practices in preparing a safe and competent workforce, to obtain information about effective innovations or methods?
3. What learning source is most relevant to the needs of fire fighters recognized as using best practices in preparing a safe and competent workforce?
4. What learning actions are used by fire fighters, recognized as using best practices in preparing a safe and competent workforce, in the learning process?

The data collected from interviews and observations of artifacts and records was used to develop and describe findings. The survey gathered demographic information on study participants and allowed them to rate statements regarding learning sources and learning actions.

Study Design

The study was descriptive in nature and was conducted in several phases. Descriptive qualitative research gathered data to describe the way things are from the perspective of the participants. This type of study is useful when understanding a process or phenomenon is desired.

The main purpose of this study was to describe the learning actions and learning sources used by fire fighters who were recognized as using best practices in preparing a safe and competent workforce. The primary reason for using a qualitative research design was the need to uncover and discover information and perspectives related to how fire fighters, recognized as using best practices in preparing a safe and competent workforce, learn.

A quantitative research design may have been called for if the learning actions and learning sources used by fire fighters who are recognized as using best practices in preparing a safe and competent workforce were known. If the purpose of this study was to determine how fire fighters who attended MFSTS training courses learned about these courses, a quantitative research method would be appropriate. What was needed to answer the research questions was not a comparison of various learning processes and methods nor a systematic measurement of variables such as length of service. What was needed was a context-rich description of the hows and whys related to the learning actions and learning sources fire fighters, recognized as using best practices in preparing a safe, competent workforce, use to learn.

When dealing with fire fighters and learning, it is useful to recognize that each fire fighter is different. Each fire fighter is different because s/he comes from a different background of experiences. A qualitative approach allowed for the description of differences among individual fire fighters along with placing those unique perspectives in the context in which they currently operate. The approach of describing the participant and the context in which the participant lives enabled the researcher to better understand how the fire fighters perceive learning. This research design was proposed as qualitative

in order to draw data from interviews and observations. The research built theory grounded in data rather than test theory. The study used a non-random sample, purposefully selected to focus on fire fighters who were recognized by the selection group as using best practices in preparing a safe and competent workforce.

Population/Sample

The study participants were drawn from Montana fire fighters. The participant selection criteria included identification of fire fighters who were recognized as using best practices in preparing a safe and competent workforce by knowledgeable members of the fire service community in Montana. Members of the MFSTS School Advisory Council and the School's Director and staff made the selection of fire fighters recognized as using best practices in preparation of a safe and competent workforce. The members of the selection group were each asked to identify five members from fire service organizations in Montana who were using best practices in preparation of a safe and competent workforce and conducting safe incident operations. The 19 fire fighters identified most often by the selection group, and who were willing to participate in the study, constituted the study group.

Advisory Council members represent a broad cross-section of the fire services in Montana. There are seven affiliations represented by the members of the Advisory Council (MCA 2-15-1519). The seven affiliations include "a fire chief, a volunteer fire fighter, a paid fire fighter, a fire service instructor, a person involved in fire prevention, a representative of the insurance industry, and a professional educator" (MCA 2-15-1519, (a)-(g)). Several members have affiliations with several segments of the fire services in

Montana. For example, one member is a member of the fire chiefs' group and the instructors' group. Another is an insurance agent and also a fire fighter. Advisory Council members are nominated by the various Montana fire service professional organizations, the education community (one or more members are educators), and the insurance industry (one or more members serve in the insurance industry). Those fire service professional organizations include the Montana State Fire Chiefs' Association, the Montana Fire Service Instructors' Association, the Montana Volunteer Fire Fighters' Association, and the Montana State Council of Fire Fighters (paid fire fighter membership organization) (MCA 2-15-1519, (2)). The Board of Regents appoints members of the Advisory Council to four-year terms. Advisory Council members serve in a policy governance role in support of the purposes of the Montana Fire Services Training School. The Council meets multiple times throughout the year to take public comment and conduct the policy business of the MFSTS. Members of the Advisory Council are active participants in the fire services in Montana and are recognized by their respective professional organizations (by nomination) as having a broad perspective on fire service in Montana.

The selection group also included five members from the MFSTS field trainer staff. The MFSTS staff is made up of a Director, an administrative support position, a logistical and service support position and five field trainers. Five field trainer staff members and the Director are practicing fire fighters in Montana and members of various fire service professional organizations. All field trainer staff members are colleagues of the researcher. The Director and field trainer staff have daily contact with members of the fire service in Montana. These individuals conduct meetings, present training

programs, support local training programs, assist in local fire service operations, address local governing bodies, develop curriculum, certify professional qualifications, and act as resources for fire fighters.

The MFSTS staff has considerable, diverse knowledge of fire fighters in Montana. As such, they were well qualified to know and identify members of the fire services in Montana who are using best practices to prepare a safe and competent workforce.

Each fire fighter was contacted by phone and/or e-mail. The e-mail contained the text of the introduction letter requesting their help with the study. For those individuals contacted by phone, the introduction letter was read to them. After initial contact was established, the researcher further explained the study to the fire fighter and asked if they would be willing to participate in the study and answered any questions they might have about the study. All of the 19 fire fighters who were asked to participate in the study agreed to do so. The first 19 fire fighters chosen by the selection group and accepting the researcher's offer to participate in the study comprised the population. All of the data were collected between the first week of January, 2004 and the first week of February, 2004.

Instrument

The primary instrument for this study was the researcher (Merriam, 1998, p. 6). The researcher has been a member of the fire service since 1976 and has been a field staff member of the MFSTS, serving full-time since 1987. The researcher writes curriculum, designs courses, and delivers educational products and services provided by the MFSTS

and he travels 35,000 miles each year serving fire fighters across Montana. The researcher is a fire chief of two fire departments providing the full range of emergency services in a 65 square mile area containing 3,000 structures and 10,000 residents with an annual budget of $550,000.

The instrument items for the Rating of Learning Sources Instrument were developed with the input from a group of fire service educators and fire service practitioners. This group of fire service educators and practitioners were members of the staff of the MFSTS and fire fighters from Missoula, Gallatin, and Lewis and Clark Counties. The researcher polled the educators and practitioners asking which learning source items should be included in the Rating of Learning Sources Instrument. The group also suggested that the Instrument provide an opportunity for the participants to identify and rate learning sources that had not been included in the list of learning sources.

The interview questions were developed initially as a pilot using the selection group as the evaluators. The selection group members who were not participants in the study validated the interview questions and provided suggestions regarding follow-up questions, identified errors, and made recommendations for improvements. The group validated that the interview questions addressed the research questions.

The researcher has extensive education and experience as a fire service practitioner and as an adult educator. As such, the researcher was in a position to recognize biases and had an intimate understanding of the circumstances and perspectives of the participants. The researcher used a series of verification strategies to ensure the rigor of the study. Morse et al. (2002) state:

> qualitative research is iterative rather than linear, so that a good qualitative researcher moves back and forth between design and implementation to ensure congruence among question formation, literature, recruitment, data collection strategies, and analysis. Data are systematically checked, focus is maintained, and the fit of data and the conceptual work of analysis and interpretation are monitored and confirmed constantly. Verification strategies help the researcher identify when to continue, stop or modify the research process in order to achieve reliability and validity and ensure rigor (p. 3).

Design Validity

A descriptive study seeks to uncover and discover information and perspectives of the participant. The researcher assumed that the meaning of the data gathered was embedded in the participant's experiences and that meaning was reported through the researcher's perspective (Merriam, 1998). Through the use of several research techniques, including triangulation, member checks, repeated observations, peer examinations of findings, participatory research processes, and clarity in the researcher's biases, the validity of the researcher as the primary instrument is strong.

As discussed by Merriam (1998), the study addressed six basic strategies to enhance validity. The six characteristics identified by Merriam as enhancing validity include triangulation to confirm emerging findings, member checks asking participant fire fighters to review the plausibility of the researcher's data, long-term or repeated observations of the fire fighters providing data, peer examinations of the findings as they emerge, participatory research mode including participants in the various phases of the research, and identifying the researcher's biases to clarify the assumptions and theoretical approach.

Triangulation involves using multiple investigators, multiple sources of data, or multiple methods to confirm the emerging findings. In this study, the data was gathered using interviews by the researcher, notes taken by the researcher during and after the interview, video and audio recording of the interviews, and observation of artifacts and records related to the participants. Study participants were given the opportunity to review and change any comments to responses to interview questions as well as to review the Rating of Sources Survey Instrument to see if any changes to their responses needed to be made.

Long-term observation at the research site or repeated observations of the same phenomenon included gathering data over a period of time in order to increase the validity of the findings. The researcher made follow-up interviews and repeated observation of the artifacts, records and contexts related to participants. Peer examination included asking colleagues to comment on the findings as they emerged.

Participatory or collaborative modes of research involved the participants in all phases of research from conceptualizing the study to writing up the findings. The study involved participants in phases of the research where their involvement strengthens the validity of the study. Identification of the researcher's biases involved clarifying the researcher's assumptions and theoretical orientation at the onset of the study. The researcher's central assumption was that the participant was accurate in reporting the methods and processes used to gain new information on best practices of fire fighting. The researcher further assumed that the participant identified those methods and processes used to discover best practices.

Identifiable biases exist in the realms of fire fighting, adult education and toward best practices that relate to improved fire fighter occupational health and safety. The researcher was biased toward being proactive toward best practices implementation as a best practice. Fire fighters who use best practices necessarily must advocate for the implementation of a best practice. That advocacy takes place at every level of the fire service. Advocacy opportunities exist at many levels, including local governing bodies for policy and budgetary support, local voters for acceptance of the goals that are actualized using best practices and the necessary financial commitment, fire fighters to try new best practices, fire officers to approve procedures to implement the best practices, and peer fire fighters to gain momentum for regional and statewide fire services best practices.

In this study the fire fighter is viewed as the customer learner in the enterprise of education. The customer service approach described by Brunacini (1996, 2002) includes listening to and understanding the context in which fire fighters live and operate and the learning actions and learning sources they use to implement best practices. In the work as a fire service educator, a learner-centered approach is the model used to meet the needs of the customer fire fighter. The customer-centered approach involves frequent direct, phone, e-mail and on-site contact with fire fighters to learn about their situation and learning needs, actions and sources.

Study Reliability

The reliability of the research method and instrumentation, including the interview process and recording of artifacts and context, assures that what was present

with the participant was accurately represented in the data and findings. The application of the classical measure of reliability–can another researcher repeat the research and reach the same conclusions–did not fit the purpose of the study. The researcher conducted the interviews. As no other researcher was present at the same time and place, nor observed the same participant or the same artifacts or records, no other researcher could participate in a repeated study reaching the same conclusions.

People and circumstances are in a state of constant change and development (Merriam, 1998). Based on people and context being on a constant state of flux, the reliability of the study and the primary instrument was assured by other, well accepted means.

The researcher used peer examination as a primary means of assuring the reliability of the data recording and analysis. Through this strategy the researcher monitored and ensured reliability.

Guba and Lincoln, as cited by Merriam (1998) address reliability in qualitative research. They assert that asking several questions of the researcher and the research design can assess reliability. Those questions ask if the interviews were reliable and valid in relation to the purpose of the study, and was the content of the documents and artifacts properly analyzed, and do the conclusions of the study rest upon the data gathered. The researcher used this process as a basis for the peer examination of the research process, analysis, and conclusions. The data gathering instruments were reviewed by five peers of the researcher. All five of the reviewers were tenured fire fighters with experience as trainers. These reviewers addressed the learning sources used in the rating of sources survey and suggested adding training/drills and incidents/

responses as learning sources. The suggestions of the reviewers were added to the rating of sources document.

Firestone, as cited by Merriam (1998), also addresses reliability of qualitative research. He states, "The quantitative study must convince the reader that procedures have been followed faithfully because very little concrete description of what anyone does is provided. The qualitative study provides the reader with a description in enough detail to show that the author's conclusion 'makes sense'" (p. 199).

Another measure of the reliability of a study is generalizability. Generalizability refers to the ability of a reader to apply the results for the research to another similarly configured group. In this study, the purpose was to describe the learning actions and learning sources of a selected group of fire fighters recognized as using best practices. The intent was to describe the particular actions and sources used by particularly selected groups, and not to address the learning methods of any other fire fighters. Merriam clarified the applicability of generalizability to this application of qualitative research. She states, "In qualitative research, a single case or small non-random sample is selected precisely because the researcher wishes to understand the particular in depth, not to find out what is generally true of the many" (1998, p. 208).

Smaling (2002) similarly addresses the matter of generalizability in qualitative research. He states, "If the research report does not claim a case to case generalization, the report should deliver information to the reader to enable him or her to decide whether the researched case is sufficiently analogical to another case which is of interest to the reader" (p. 3). Merriam suggests that through the use of rich, thick description, "readers will be able to determine how closely their situations match the research situation, and

hence, whether findings can be transferred" (1998, p. 211). The researcher used rich, thick description and peer examination, member checks, and participatory research implementation and management to assure the reliability of the study.

Scoring/Meaning

Data gathered from the study was analyzed to describe, identify, and develop patterns in the learning actions and sources used by fire fighters who were recognized as using best practices. The meaning of the information and observation gathered by the researcher was in the participants' description of the learning action or source. Study participants rated the frequency and relevance of use for each statement on the Rating of Sources Instrument. Data from the Rating Sources Instrument was analyzed based on frequency counts. The rating scale ranged from 1-5, with one representing no use and five representing frequent use. Analysis of the data provided the basis for making further recommendations for study regarding fire service education program development and implementation.

Fire fighters identified by the selection group were invited to participate in the research. Potential participants were sent letters of introduction followed up by personal contact by the researcher. The researcher made arrangements for interviews and observations of the participant and their work context. Fire fighters who agreed to participate in the study granted their permission for the use of the data gathered during the study. Identities of specific participants were omitted except for appropriate demographic and contextual descriptions from the reporting of the research.

Data Collection

Data collection for this study included interviews with participants (recorded by video, audio and by interviewer notes), notes describing artifacts and records, demographic information about the participant, and a rating by the participant of learning sources for frequency of use and relevance. The data-gathering instrument can be found in Appendix A.

The records and notes of the interviews and observations provide a relatively incontestable description of the hows and whys of participant learning (Stake, 1995). The data also provided a basis for further study, both qualitative and quantitative in nature. The data collection for this study included interviews with participant fire fighters. The interviews included structured research questions and unstructured follow-up questions addressing avenues of inquiry discovered during the structured portion of the interview. The interviews were recorded in video and with audio data. The on-site visitation facilitated the study of artifacts used by the fire fighter being interviewed. The artifacts were recorded by using a video data collection device. Records, including procedures used by fire fighters, were also studied. The researcher made notes during and after the interview and on-site study of the artifacts and records. The researcher also recorded demographic information about each fire fighter participant in the study.

Where needed, the researcher made follow-up contacts and on-site visits with fire fighters. In the event a fire fighter who was an original member of the group could not participate, another individual was nominated to fill the vacant slot.

Analysis

The purpose of this study was to identify and describe the learning actions and learning sources used by a selected group of fire fighters in Montana who were recognized as using best practices in preparing a safe and competent workforce. The analysis of the data included the search for patterns and themes in learning actions and sources used by the selected group of fire fighters to learn about best practices used in the preparation of a safe and competent workforce. The data was gathered through a series of individual observations that led to a series of summary descriptions. The data analysis focused on searching for patterns (Stake, 1995). The patterns discovered, or found to be absent, provided a foundation for implementing future training programs for all the fire fighters.

The analysis also included examples of artifacts and records. The artifacts and records were used to analyze whether the participants are doing what they said they were doing. The identification and development of patterns and themes was the primary analysis that was reported. Additional analysis includes descriptions of the context in which the participant operates as well as compiling and presenting demographic data.

Summary

The purpose of this study was to identify and describe the learning actions and learning sources used by a selected group of fire fighters in Montana who were recognized as using best practices in preparing a safe and competent workforce. The research group was selected by experts in the field of fire services and was non-random

and purposeful. Using a qualitative research design including fieldwork observations and interviews, the researcher was able to identify patterns of learning actions and learning sources used by fire fighters who were recognized as using best practices. The description of learning actions and learning sources used by the participant includes detailed information about the participant and the contexts in which they worked.

CHAPTER 4

ANALYSIS OF DATA

This chapter presents the analysis of data related to the research questions of the study. The purpose of this study was to identify and describe the learning actions and learning sources used by a selected group of fire fighters in Montana who are recognized as using best practices in preparing a safe and competent workforce.

Data was gathered through interviews, observations of artifacts, and a survey instrument. The survey instrument consisted of three parts. The first part gathered demographic data about the study participants and the fire service organizations they served. The second part of the survey consisted of a rating of various learning sources. The rating, using a Liekert scale, was constructed to access the frequency with which the study participants used each learning source and the relevance of each source. In the final part of the survey, study participants responded to seven interview questions. All of the data was collected between the first week of January, 2004 and the first week of February 2004.

There are three major sections of this chapter that pertain to data analysis. These sections follow the format established in the survey instrument and include demographic information presented primarily through tables, presentation of data from the Liekert scale, and analysis of responses to the seven open-ended interview questions.

Selection of Study Participants

The selection group to identify potential study participants was composed of 15 members. The group consisted of eight members of the MSU Extension Services, Montana Fire Service Training School (MFSTS) Advisory Council (Council), and seven MFSTS field staff members including the Director of the School. The MFSTS field staff and Director are tenured fire service educators who live in Montana. Collectively they have more than 150 years of international fire service experience. All field staff are accomplished fire service practitioners who travel the state extensively. The selection group included fire service educators and practitioners from Cascade, Missoula, Flathead, Lake, Yellowstone, Roosevelt, Chouteau, and Ravalli Counties.

The members of the selection group were each asked to identify five fire fighters who met the selection criteria and were recognized as using best practices in preparing a safe and competent workforce. All selection group members made their selections between December 15, 2003 and the middle of January, 2004. Seventy-seven fire fighters were nominated by the selection group as fire fighters who were acknowledged for their best practices. The lowest number nominated by a member of the selection group was two, while the most was seven. There was a natural break in the frequency of recognition. The 19 fire fighters selected met the selection criteria (see Appendix B) and became the study participants. Nominated fire fighters were then contacted by phone, the purpose of the study was explained, and they were asked if they were willing to participate in the study.

All data collection occurred in January and February 2004. Data collection was conducted on-site. On average, the interviews lasted approximately 60 minutes at each site. The return rate for data collection was 100%.

Description of Instrument Pilot Test

The demographic data, the Rating of Sources Instrument, and the interview questions were pilot-tested using six members of the fire service in Montana. Two of the members were MFSTS field staff educators, and four were fire service practitioners. No changes were offered for collecting demographic data. The six members of the pilot test group indicated that the information would provide an adequate description of the context in which the participants provided service.

The instrument reviewers indicated that the interview questions were sufficiently directed toward the research questions to allow the participant to identify and describe any learning source they used. They did not offer any changes to the interview questions, but they did offer two changes to the Rating of Sources Instrument. The six reviewers suggested adding training/drills and responses/incidents to the sources list used on the Rating of Sources Instrument. It was indicated that observations of fire fighters during periods of activity where they are performing the functions of fire fighting were rich environments for assessing the current condition of the preparation of those fire fighters. Instrument reviewers also indicated that observing fire fighters during periods of deployment also allowed observation of the effectiveness of technology and equipment, operating procedures, and interpersonal interaction. Based on this recommendation, two items were added to the Rating of Sources Instrument.

The instrument reviewers indicated that the combination of the demographic data, the Rating of Sources Instrument, the interview questions and the analysis of artifacts created a sufficiently detailed understanding of the learning actions and learning sources used by study participants. They also indicated that the various data gathering techniques provided overlap to assure that what the participants said, rated, or demonstrated by artifact could all be connected and assessed to see that what was said was, in fact, what was done.

Participant Demographic Information

Demographic data was gathered from the participants' answers to the questions in the first part of the survey instrument. All participants completed all questions in the demographic section of the survey. The data in Table 1 is presented based on the rank and role of the study participant. Thirteen participants were fire chiefs, five were fire officers, and one was a fire fighter/engineer. Thirteen of the 19 participants were between the ages of 41 and 55.

Table 1. Age Category

		Fire Chiefs		Fire Officers		Fire Fighter/Engineer	
		n	%	n	%	n	%
Age	30-35	1	5	3	16	0	
	36-40	0		0		0	
	41-45	1	5	1	5	1	5
	46-50	6	32	0		0	
	51-55	4	21	0		0	
	55-60	0		1	5	0	
	60-65	1	5	0		0	
N=19	TOTAL	13		5		1	

Participants were asked to identify their pay status in their current role and/or rank within the organization they served. Of the 13 fire chiefs, three were paid for their service and ten received no pay for their service. Of the five fire officer participants, four were paid for their service and one received no pay for his/her service. The one fire fighter/engineer was paid for his service. Table 2 presents this data for all participants.

Table 2. Pay Status Based on Rank/Role

		Fire Chiefs	Fire Officers	Fire Fighter/Engineer
Paid		3	4	1
Not paid		10	1	
N= 19	TOTAL	13	5	1

All participants were asked to indicate the number of years of fire service experience they had. There was a broad range of service for the study participants. Of the 13 participants who serve as fire chiefs, three had served for 10-15 years, five for 16-20 years, one had served for 21-25 years, three had served for 26-30 years, and one had served for 31-35 years. Of the five fire officers, two had served for 10-15 years, two for 16-20 years, and one had served for 36-40 years. The fire fighter/engineer had served for 16-20 years. Table 3 presents this data for all participants.

Table 3. Years of Service Based on Rank/Role

		Fire Chiefs	Fire Officers	Fire Fighter/ Engineer
10-15 years		3	2	
16-20 years		5	2	1
21-25 years		1		
26-30 years		3		
31-35 years		1		
36-40 years			1	
N= 19	TOTAL	13	5	1

Table 4 presents data on the number of years of fire service experience each study participant had served in their rank or role. Of the 13 participants who served as fire chiefs, five had served for one to five years, three for six to ten years, four had served for 11-15 years, and one had served for 21-25 years. Of the five fire officers, two had served for one to five years, two for six to ten years, and one had served for 16-20 years. The fire fighter had served for 16-20 years.

Table 4. Years of Service Based on Rank/Role

	Fire Chiefs	Fire Officers	Fire Fighter/Engineer
1-5 years	5	2	
6-10 years	3	2	
11-15 years	4		
16-20 years		1	1
21-25 years	1		
N= 19 TOTAL	13	5	1

Participants were asked if they used various electronic resources (Table 5). All the participants serving as fire chiefs used e-mail, 12 reported using the Internet, four used a pager for administrative contact (all used pagers for emergency alerting), and all used cellular phones. All participants serving as fire officers used e-mail, all used the Internet, one used an administrative pager, and all used cellular phones. The fire fighter/engineer used e-mail, the Internet, an administrative pager, and a cellular phone.

Table 5. Electronic Resources Used Based on Rank/Role

	E-mail	Internet	Pager	Cell Phone
Fire Chiefs	13	12	4	13
Fire Officers	5	5	1	5
Fire Fighter/Engineer	1	1	1	1
TOTAL	19	18	6	19

Participants were asked to indicate the number of periodicals and journals they subscribed to or read regularly (Table 6). One of the 13 participants who serve as a fire chief did not read any journals or periodicals. Twelve of the 13 fire chief participants read two or more journals, and five of those 12 read six or more journals. All of the fire officers read two or more journals with one of the five reading eight journals. The fire fighter/engineer indicated that he read eight journals.

Table 6. Number of Periodicals and Journals Subscribed to Based on Rank/Role

	Fire Chiefs	Fire Officers	Fire Fighter/Engineer
0	1		
1			
2	2	2	
3	1	1	
4	4	1	
5			
6	2		
7	1		
8	1	1	1
9 or more	1		

Table 7 presents the responses to the question on the highest level of education study participants completed. Ten of the 13 fire chiefs had completed one or more years of study after completing high school, five had completed two years of college, one had completed three years of college, one had competed four years of college, and one had completed a master's degree. All of the fire officers had completed two or more years of study beyond high school, one had completed two years, one had completed three years, and three had completed four years of college. The one fire fighter/engineer who participated in the study had completed four years of study after high school.

Table 7. Years of School by Role and Rank

	Fire Chiefs	Fire Officers	Fire Fighter/ Engineer
High School	3		
High School + 1 yr.	2		
High School + 2 yrs.	5	1	
High School + 3 yrs.	1	1	
High School + 4 yrs.	1	3	1
High School + 5 yrs.	0		
High School + 6 yrs.	1		
N=19 TOTAL	13	5	1

Study participants were asked to describe the community and agencies they served. In two instances, two study participants represented the same fire district. The total number of communities and fire districts in which the study participants served was 17. The population of the communities served ranged from 3,000 to 109,000. The total population served was 371,800. The area served by these organizations ranged from five square miles to 5,000 square miles. The number of incidents that fire personnel responded to ranged from 70 to 9,500. Eleven of the 17 agencies were staffed entirely by members who volunteered to serve. Four of the agencies were staffed entirely by members who were paid to serve, and four of the agencies were staffed by a combination of members who volunteered and were paid to serve.

The study participants served communities in 13 counties (see Appendix C). The agencies in which the participants served included ten unique governance structures ranging from single entity jurisdictions to multiple entity jurisdictions. A more detailed look at the study participant governance structures included four types of single entity jurisdictions, including eight organizations in which eight participants served, and six types of multiple entity jurisdictions, including nine organizations in which 11 participants served (see Table 8). The 19 participants served a total of 17 agencies. Two

members from the same agency participated in the study. The agencies included five agency configurations and six combinations of agency configurations. All the agencies are established pursuant to Montana Codes Annotated.

Table 8. Governance Structures

Configurations of Fire Service Entity(s)	Number of Entities
Rural Fire District	5
Rural Fire District contracting with a city	1
Rural Fire District jointly serving with a city Fire Department	4
Fire Service Area	1
County Fire Department	1
Consolidated Fire Department	1
City Fire Department	1
City Fire Department contracting with Fire Districts	1
City Fire Department with Fire Service Area	1
City Fire Department, county wide ambulance	1
City Fire Department with County Fire Department	1

The five agency configurations were rural fire district, fire service area, county fire department, city fire department, and a consolidated government fire department. Five participants served rural fire districts, one participant served a fire service area, one participant served a county fire department, one participant served a city fire department, and one participant served a consolidated government fire department.

Ten participants served in agencies that were combinations of the six agency governance configurations. The combinations of agency configurations included rural fire districts that provided service under contract to a city, a city fire department that provided service under contract to a fire service area, a city fire department that provided service under contract to serve rural fire districts, a city fire department and a rural fire district that were separate government agencies and operated as a joint fire department, a city fire department that provided county-wide ambulance service, and a city fire

department that provided service to a county.

One participant served with a rural fire district that provided service under contract to a city. One participant served with a city fire department that provided service under contract to a fire service area. Two participants served with a city fire department that provided service under contract to several rural fire districts. Four participants served with a city fire department and a rural fire district that were separate government agencies and operated as a joint fire department. One participant served with a city fire department that provided county-wide ambulance service. One participant served with a city fire department that provided service to a county.

Research Questions

Each of the research questions was investigated using the data gathered from the survey instrument. The data collected were both quantitative and qualitative. The quantitative data were analyzed based on frequency distributions. Qualitative data were analyzed based on comments made by study participants to the seven open-ended interview questions. Both data types were used to answer the research questions.

Research Question 1

> Where do fire fighters recognized as using best practices in preparing a safe and competent workforce first receive information regarding effective methods or innovations?

In order to answer this research question, responses to the open-ended survey questions 1a, 1b, 2a, and 2b (see Appendix A, interview questions) were analyzed. The first interview question used to investigate this research question asked, "How, in your

opinion, has the fire service changed over the past five years?" There were three follow-up questions which were Interview Questions 1b, 2a, and 2b. Question 1b asked, "As a member of the fire service, what effective methods or innovations have you used within your fire department in the past five years that you feel have improved your fire department and community?" Question 2a asked, "What learning actions did you take that resulted in your becoming aware of these changed, effective methods or innovations?" Question 2b asked, "How did you become aware of these changes, effective methods, or innovations?"

The purpose of asking the four questions was to have the study participants identify changes, then focus on innovations or effective methods used in the context of those changes. This was followed by a question to focus on how they became aware of the changes, effective methods, or innovations. These four questions were designed to gain an understanding of how the study participants became aware of the changing environment and the effects of these changes on their job.

The changes in the fire service environment identified by the participants included technologies, personnel recruitment, retention, empowerment, training and development, changing communities and community expectations, learning, and an increased focus on member safety. The following comments from the participants illustrate the changes facing fire service organizations in Montana.

> You don't get to stand still. The rest of the world is going to pass you by.
> (Fire Chief w/25 years of service)

> Our customers want and get one on one service. They call us a lot more. Our fire fighters still care about the customer.
> (Firefighter/engineer w/17 years of service)

...our job is continually evolving, primarily based on, in our case, customer growth and also a more sophisticated customer, a more demanding customer. Our activity level is growing. Our expectations and goals have changed. We a retaking a bigger, better look at what the work is. And so, therefore, that has necessitated us making some significant changes.

(Fire Officer w/40 years of service)

Our public has changed. They expect the same service any where in the country.

(Fire Chief w/28 years of service)

Technologies have changed. Now we have compressed air foam systems, gas detection meters, thermal imagers, defibrillators. These enable us to offer the next level of service.

(Fire Officer w/15 years of service)

The fire service has change immensely in the past five years. Fire fighters must become more educated on way more subjects.

(Fire Officer w/12 years of service)

The work has become a lot more technical, more customer oriented, more educational for us and for the community and the customer. Attitudes have changed, this is not just the social club it used to be, to where it is a professional job.

(Fire Chief w/10 years of service)

We have become more aware of innovations.

(Fire Chief w/18 years of service)

Question 2b asked, "As a member of the fire service, what effective methods or innovations have you used within your fire department in the past 5 years that you feel have improved your fire department and community?" The responses included technologies, increased focus on customer service, improved member training, increased attention to responder safety, continuous improvement of operations, and customer feedback. The themes that emerged are represented by the following comments.

Seeing what is going on out in your community.

(Fire Officer w/12 years service)

Our community based programs that reach out and touch people. We are in the opportunity scan mode. If we are listening and watching, always looking for opportunities to help customers, the opportunities present themselves. It's a big deal.

(Fire Chief w/34 years service)

Clearly, what works for us on an ongoing basis is where we get together, and if we can collectively get people's heads together, there is a synergy in that that comes up with way better solutions than anyone person could do or does do on their own. It comes informally. It comes at coffee, it comes in a ride together, there is a synergy when you get them together and get them focused on something.

(Fire Officer w/40 years service)

Set goals where they seem unreachable, and then try to reach them. You never stop as a Chief.

(Fire Chief w/17 years service)

Focus on the questions of where we are at and where we want to go.

(Fire Chief w/10 years service)

The biggest thing I notice, changes in training that allow what we learn to be relayed in a more effective manner, and changes it so that rather than reading it out of a book, or standing outside learning parts (of a drill), we have put together what we do in the street, and making that training look like what we want to practice in the street.

(Fire Fighter w/20 years service)

The biggest thing I have been involved in is pushing for the MFSTS Fire Fighter 1 and Fire Fighter 2 professional qualifications certification in our department. If we are going to spend time doing something, I want it to be effective. I want to learn something and the guys I work with to benefit from it.

(Fire Officer w/20 years service)

MFSTS training programs have been very effect. We have had a training facility since 1990 and we were one of the first fire departments in Montana to certify with the new Fire Fighter 1 certification standards.

(Fire Chief w/28 years service)

Repetition focusing on understanding what we actually respond to and what we do on a regular basis and then making that training and making that better.

(Fire Officer w/17 years service)

The learning actions the study participants took that resulted in their becoming aware of the changing environment and effective methods and innovations to respond to the changing environment were more alike than different. These learning actions included networking with peers, observing other fire departments, reading texts, periodicals, and electronic newsletters, trying ideas in training and during incident responses, actual service delivery, and maintaining an open mind and a willingness to learn. The following comments from the participants illustrate the learning actions they took to become aware of changes, effective methods and innovations.

> I learn more from informal stuff, and I have a four-year degree. Let's go look, let's go walk around up town and look around.

> As far as learning actions, I can't do very well reading books, and I am a book person. I read all the time, but as far as a fire book, I think it is more of an action learning system (the fire service).

> I am my best resource. The way I become aware, on a fire level, is I say, "Hey John (co-worker), how did this go yesterday?"
>
> (Fire Officer w/17 years service)

> Continue to learn, continue to network with people who are a lot smarter than you are. They tell you about new changes they have done that are effective or ones that are not effective and why.
>
> (Fire Chief w/20 years service)

> I don't do a lot of Internet viewing outside of the State's materials (e-mail newsletter). I read books and try to apply that to our department if that is appropriate or applicable.
>
> (Fire Officer w/15 years service)

> That means you have to approach things with an open mind. Use those resources that you trust, that you have come to trust over the years that you know will be good, and you apply them to your problem to come up with a different scenario at the end of the problem.
>
> (Fire Chief w/12 years service)

> The only thing I did was seek information. That is all I have done my whole career, is seek information. I've never been one to sit and wait for somebody to tell me what is going on.
>
> (Fire Officer w/20 years service)

> Networking, it's incredible that amount of information that's out there if you are willing to make yourself available, put your self in a position where you can tap it and expose yourself to it.
>
> (Fire Chief w/34 years service)

> Observations in society and observations of calls in the District over twenty-eight years. I use networking a lot. I work with our county fire council of 14 fire departments.
>
> (Fire Chief w/28 years service)

> The actions we have taken are networking actions. It's talking to other people in the fire service and finding out what they are doing.
>
> (Fire Chief w/30 years service)

> My number one learning action is experience. I interact with other chiefs and learn what other people are doing.
>
> (Fire Chief w/17 years service)

> I'd say the biggest part of it (my awareness) was through the Fire Training School (MFSTS), most of my awareness has come through that.
>
> (Fire Chief with 10 years service)

> Visiting with your peers is probably one of the best things you can do as far as I am concerned.
>
> (Fire Chief 25 years service)

From analysis of the responses, it is apparent that fire fighters who use best practices in preparing a safe and competent work force use learning sources during the initial or early stages similar to the ones used through the remainder of the learning process. Furthermore, based on participant responses to questions related to the first study research question, it is apparent that learning sources that are useful are retained. Participants indicated in their responses that they would use and re-use learning sources and actions. They indicated that continuing interaction with leaders was relevant to their

learning. They also indicated that application of ideas followed by assessment use a useful learning action.

Research Question 2

> What learning sources are used most by fire fighters recognized as using best practices in preparing a safe and competent workforce?

Research Question 2 was investigated using the data provided by study participants in answering question 3a and the Rating of Sources Survey Instrument, Part 2 (see Appendix A). The Rating of Sources Instrument was configured to allow the participants to rate learning sources based on the frequency with which they used them and the relevance of each source.

The results of the Rating of Sources Instrument (Table 9) showed the most frequently used learning sources included public consultants from the MFSTS, the Internet (including the MFSTS e-mail newsletter and other lists), the MFSTS Resource Center, other members of the fire service, fire service classes in Montana sponsored by MFSTS, incidents/responses, and training/drills. Data indicated that these learning sources were used frequently by 14 or more participants. The next most frequently used learning sources were used by nine or fewer of the 19 participants.

Ten participants indicated that they found public consultants from the MFSTS a frequently used learning source (selecting a value of 5). Four participants indicated some use of public consultants from the MFSTS as a learning source (selecting a value of 4).

Seven participants indicated the Internet (including the MFSTS e-mail newsletter and other lists) was a frequently used learning source (selecting a value of 5). Eight participants indicated that they made some use of the Internet as a learning source

(selecting a value of 4).

Table 9. Frequency Use Table

	Frequency of Use of Source				
	No Use		Some Use		Freq't Use
	1	2	3	4	5
Consultants					
Private	8	7	3	1	0
Public (MFSTS)	0	0	5	4	10
Magazines/Professional Journals	0	3	7	8	1
Texts	0	3	9	6	1
Videos	0	4	6	7	2
Video Conferencing	9	7	3	0	0
Satellite programs (FEMA, others)	11	8	0	0	0
Internet (The Latest, Other lists, etc.)	0	1	3	8	7
MFSTS Resource Center	0	1	3	8	7
NFPA Standards	1	2	7	7	2
Other members of the fire service	0	0	3	6	10
Fire Service Classes in MT by MFSTS	0	0	3	10	6
Fire Service classes inside MT	5	6	3	5	0
Fire Service classes outside MT	4	5	6	4	0
General (non-fire) classes in MT	1	4	8	4	2
General (non-fire) classes outside MT	10	3	4	2	0
Friends not in fire service	1	4	8	5	1
Fire Service Professional Orgs.	0	8	6	5	0
Allied Professionals	1	6	8	4	0
Incidents/responses	0	0	1	8	10
Training/drills	0	0	2	8	9
Other	0	1	1	3	5
Manufactures/vendors					
Industry					
Customer					
Respondent's family					
Weather/Environment					
Reflection					
Daily Observations					

Seven participants indicted they found the MFSTS Resource Center a frequently used learning source (selecting a value of 5). Eight participants indicated that they made some use of the MFSTS Resource Center as a learning source (selecting a value of 4).

Ten participants indicated that they found other members of the fire service a frequently used learning source (selecting a value of 5). Six participants indicated that they made some use of other members of the fire service as a learning source (selecting a value of 4).

Six participants indicated they frequently used fire service classes in Montana sponsored by MFSTS as a learning source (selecting a value of 5). Ten participants indicated they made some use of fire service classes in Montana sponsored by MFSTS (selecting a value of 4).

Ten participants indicated that they frequently used incidents/responses as learning sources (selecting a value of 5). Eight participants indicated that they made some use of incidents/responses as a learning source (selecting a value of 4).

Nine participants indicated they frequently used training/drills as learning sources (selecting a value of 5). Eight participants indicated that they made some use of training/drills as learning sources (selecting a value of 4).

There were five sources the study participants indicated they used least frequently. These were private consultants, video conferencing, satellite programs, other fire service classes in Montana (other than MFSTS classes), and General (non-fire) related classes outside Montana.

Eight participants indicated they made no use of private consultants (selecting a value of 1). Seven participants indicated that they made limited use of private consultants (selecting a value of 2). Nine participants indicated they made no use of video conferencing (selecting a value of 1). Seven participants indicated they made limited use of video conferencing (selecting a value of 2). Eleven participants indicated

they made no use of satellite programs (selecting a value of 1). Eight participants indicated they made limited use of satellite programs (selecting a value of 2).

Five participants indicated they made no use of other fire service classes in Montana (other than MFSTS classes) as learning sources (selecting a value of 1). Six participants indicated they made limited use of satellite programs as learning sources (selecting a value of 2). Ten participants indicated they made no use of general (non-fire) related classes outside Montana as learning sources (selecting a value of 1). Three participants indicated they made limited use of general (non-fire) related classes outside Montana as learning sources (selecting a value of 2).

Research Question 3

> What learning source is most relevant to the needs of fire fighters recognized as using best practices in preparing a safe and competent work force?

Data to answer Research Question 3 is in Table 10. The data indicates that the most relevant learning sources included public consultants (MFSTS), the MFSTS Resource Center, other members of the Fire Service, fire service classes in Montana hosted by the MFSTS, incidents/responses, and training/drills. Participants indicated that these learning sources were rated as relevant (used or frequently used) by 16 or more of the study participants.

Thirteen participants indicated that they found relevant public consultants from MFSTS (selecting a value of 5). Four participants indicated that they found relevance in public consultants from MFSTS (selecting a value of 4). Ten participants indicated that they found the MFSTS Resource Center relevant (selecting a value of 10). Eight

participants indicated they found relevance in the MFSTS Resource Center (selecting a value of 4). Twelve participants indicated that they found other members of the fire service relevant learning sources (selected a value of 5). Five participants indicated that they found relevance in other members of the fires service as learning sources (selecting a value of 4).

Ten participants indicated that they found fire service classes in Montana by MFSTS relevant learning sources (selecting a value of 5). Six participants found relevance in fire service classes in Montana by MFSTS (selecting a value of 4).

Thirteen participants indicated that incidents/responses were relevant learning sources (selecting a value of 5). Five participants indicated that they found relevance in incidents/responses as learning sources (selecting a value of 4).

Fourteen participants indicated that training/drills were relevant learning sources (selecting a value of 5). Five participants indicated that they found relevance in training/ drills as learning sources (selecting a value of 4).

The learning sources the study participants indicated they rated least relevant (selected a value of 1-2) included private consultants, video conferencing, satellite programs, other fire service classes in Montana (other than MFSTS classes), and general (non-fire) related classes outside Montana. Between seven and 14 of the study participants indicated they used these sources infrequently or not at all (selected a value of 1 or 2).

Nine study participants indicated they did not find relevance in the use of private consultants. Two study participants selected a value of 2, indicating that they used private consultants between no use (a value of 1) and some use (a value of 3). Seven

participants indicated that they did not find relevance in the use of video conferencing. Two participants indicated that they found limited relevance in the use of video conferencing (selected a value of 2). Ten participants indicated that they found no relevance in satellite programs (selecting a value of 1). Four participants indicated that they found limited relevance in satellite programs (selected a value of 2). Five participants indicated that they found no relevance in fire service classes in Montana other than those offered by MFSTS (selecting a value of 1). Two participants indicated that they found limited relevance in fire service classes in Montana other than those offered by MFSTS (selecting a value of 2). Nine participants indicated that they found no relevance in general (non-fire) classes outside Montana (selecting a value of 1). Three participants indicated that they found limited relevance in general (non-fire) classes outside Montana (selecting a value of 2).

Table 10. Relevance of Use Table

	Relevance of Use of Source				
	No Use		Some Use		Frequent Use
	1	2	3	4	5
Consultants					
Private	9	2	3	5	0
Public (MFSTS)	0	0	2	4	13
Magazines/Professional Journals	0	6	6	6	1
Texts	1	3	5	8	2
Videos	0	0	6	7	6
Video Conferencing	7	2	6	2	2
Satellite programs (FEMA, others)	10	4	3	2	0
Internet (The Latest, Other lists, etc.)	0	0	5	9	5
MFSTS Resource Center	0	0	1	8	10
NFPA Standards	1	1	5	6	6
Other members of the fire service	0	1	1	5	12
Fire Service Classes in MT by FSTS	0	0	3	6	10

Table 10 (Cont'd)	5	2	5	4	3
	3	3	4	7	2
Fire Service classes inside MT	1	2	6	7	3
Fire Service classes outside MT	9	3	2	3	2
General (non-fire) classes in MT	1	1	4	9	4
General (non-fire) classes outside MT	0	2	9	8	0
Friends not in fire service	0	0	1	5	13
Allied Professionals	0	0	0	5	14
Incidents/responses	0	1	2	2	5
Training/drills					
Other					
Manufactures/vendor					
Industry					
Customer					
Respondent's family					
Weather/Environment					
Reflection					
Daily Observations					

There were seven learning sources identified by the participants that were not on the list of sources in the instrument. These included customer (indicated twice), manufacturers and vendors (indicated twice), daily observation (indicated once), thinking about the work (indicated once), industry (indicated once), family (indicated once), and the weather environment (indicated once).

The learning sources used by fire fighters who were recognized as using best practices to prepare a safe and competent work force included networks with peers, staff, courses and the Resource Center from the MFSTS, Internet and e-mail newsletter, watching incident responses, and watching training drills. The following comments from the study participants illustrate the learning sources used by the participants to obtain information about effective methods or innovations. These comments, combined with those made in the investigation of Research Question 1, and the results of the Rating of

Sources Instrument, address both the frequency of use of learning sources and the relevance of learning sources.

> People are the most effective sources. I'm a little biased, I like people. I've learned more from people over the years than any other source.
> (Fire Chief w/20 years service)

> The best source to go to when you are looking for additional training or how to get better in the department or whatever, is to be networked to other people doing the same thing.
> (Fire Chief w/25 years service)

> Ultimately getting information from other folks, then taking a look at how that actually works and then additional sources, did it work for other people well, was it safe, did the community buy into it, would my members buy into it, is it right for them on what I know of how they operate and how I think things should be done, so we are taking care of them and supporting the community.
> (Fire Officer w/15 years service)

> I listen to the fire fighters.
> (Fire Officer w/12 years service)

> And along with close friends, we use MFSTS. Folks they bring in are frequently a good sounding board, and I get input from them.
> (Fire Chief w/12 years service)

> I also like talking to people, people like Brunacini.
> (Fire Officer w/20 years service)

> Try to surround yourself with people who have those skills. I have been fortunate, over the years to be able to do that. I've got a network of friends and professionals who are at your finger tips, at your disposal, and all you have to do is pick up the phone and call or e-mail. They will give you more information than you hoped for. Staying connected to friends that have expertise in all these areas we are involved with is huge. It's just, pick brains and get the information.
> (Fire Chief w/34 years service)

> The first place I look is to close associates.
> (Fire Fighter w/20 years service)

> The resource center at the MFSTS and NFPA.
> (Fire Chief w/17 years service)

> We get a lot of support from the Montana Fire Services Training School.
> (Fire Chief w/28 years service)

> The Fire School (MFSTS) is heavily involved in everything we do with training. The School (MFSTS) has a lot of resources, as far as the training props that they can bring around that we use. They have a good resource library.
> (Fire Chief w/18 years service)

> Primarily through the Fire School (MFSTS).
> (Fire Chief w/10 years service)

Research Question 4

> What learning actions are used by fire fighters, recognized as using best practices in preparing a safe and competent workforce, in the learning process?

This research question was investigated using the data provided by the study participants in answering interview questions 2a and 4b (see Appendix A for Interview Questions, items 2a and 4b.). The purpose of asking Question 4b was to have the study participant identify learning actions they currently use and expect to use in the future. The questions were asked as follow-ups to questions 1a, 1b and 4a that asked what changes the participant had seen and foresaw for the fire service. This approach attempted to identify learning actions that the study participants were currently using and foresaw using in the future. The learning actions the participants forecasted that they will use to assure that they are aware of changes, effective methods and innovations in the future, were similar to those learning sources identified by participants in reflecting on their current learning actions and took many forms. The learning actions included networking with other fire fighters and peers (including MFSTS staff), observing other fire departments, reading texts, periodicals, and electronic newsletters (including the

MFSTS Resource Center), trying ideas in training and during incident responses, and feedback from actual service delivery.

The following comments from the participants illustrate the learning sources they foresee using in immediate application to assure that they are aware of changes, effective methods and innovations in the future.

> I will seek sources and build on it and make it my own.
> (Fire Officer w/20 years service)

> I will continue to learn. I will go to schools, meet fire fighters all across the country, learn from people, half of what you learn is outside the classroom. I will cause myself to go to conferences.
> (Fire Chief w/20 years service)

> I will pay a whole lot of attention to my friends, or the people I'm networked with. I'll ask, "What are they thinking about? What are they worried about? Where are they going with their departments?" I foresee getting more learning actions through more people going out and learning.
> (Fire Chief w/25 years service)

> If we are going to embark on a project or a philosophy of what we are going to be doing, we need to make sure it is sustainable. This is so we can sustain it as a fire department, that our members are able to understand it and sustain it and that the community supports it and is able to sustain the change.
> (Fire Officer w/15 years service)

> Constantly monitor what is going on around the city. Connect with the community. I expect to keep up with the Montana Fire Services Training School, and with new technology. I will work on my education beyond the 2 year degree I am finishing now. Take time to learn from what we do. I don't take anything for granted.
> (Fire officer w/12 years service)

> We'll implement some new ideas to get some better outcomes.
> (Fire Chief w/12 years service)

> Stay connected with other organizations, with people who can help us with new ideas, technology, different ways of doing business.
> (Fire Chief w/17 years service)

I think the best learning action is keeping your ears open and your mouth shut. I think listening is the best thing I can do. Continue to listen, hear the customers, listen to internal customers. Opening our minds, listen to the folks who are out there doing it everyday.

(Fire Chief w/30 years service)

I'm well positioned. I get the daily e-mail from the School (MFSTS daily e-mail newsletter). I get 4-5 publications that I read monthly. Visiting with MFSTS staff, Tom McIsaac, MFSTS staff member) has been a good resource because we see him a lot, he is a conduit. In general the School has been a very good conduit.

(Fire Officer w/40 years service)

Try to get ahead of it. We try to do, see things that are going to happen ahead of time and we do a lot of that through the training and get it fixed while we are doing the training rather than let it get to be a problem. Learning from others' experience how and why things happen. I don't think we should have to experience that to learn from something that happened to somebody else.

(Fire Chief w/18 years service)

I can never learn enough, we cannot stand still. It has to be a continuous process.

(Fire Chief w/25 years service)

Artifact Analysis

Part of the research methodology used in this study was an analysis of the artifacts related to the study participants. Since the data was collected on-site, there was ample opportunity to identify artifacts that supported both what was written on the survey and the responses to the seven open-ended interview questions. The search for artifacts and their connection to the study participants was used to affirm by triangulation the validity of the data gathered from the participants. The following examples illustrate how the artifacts substantiated the data gathered from the survey and interviews.

A fire chief with ten years service used a recent downtown fire as a learning tool. The fire burned in a row of contiguous buildings lining the main street in the town. The fire was well established upon arrival of the fire department. The fire department, under

the command of the fire chief, contained the fire to the building or origin, saving the neighboring building. The site of the fire clearly shows that the strategy and tactics used by the fire department members were effective in controlling the fire and limiting the loss to other property. This incident is used as a case study by other fire departments.

There was evidence of the impact of courses offered by the MFSTS. In one instance, a fire chief with 25 years service undertook a project of purchasing a new pumper truck. The truck is equipped with many innovative features that make the work of a fire fighter more efficient and more effective. One example is the compressed air foam system that is built into the truck. The system uses a combination of water, a foam concentrate, and an air compressor to manufacture a high quality foam product that is five to ten times more effective than water as a an extinguishing agent. The hose is also lighter due to the air content in the stream which makes the work of dragging around the hoses less stressful for the fire fighters. This new pumper truck is the second truck the department uses that is equipped with compressed air foam. The department first started using compressed air foam systems in 1989, immediately after a seminar sponsored by the MFSTS.

Peer networking was identified in the survey and interviews as being an integral part in learning new innovations and sharing resources. As evidence of this, a 40-year fire officer works with new and in-service fire fighters as a trainer. The fire officer has been instrumental in the development of a comprehensive training facility funded and used by four neighboring fire departments. The training center includes many leaning props, as well as a facility to allow fire fighters to attack real structure fires in a training setting. The training facility has been in use for ten years. During that ten years, several

training props have been added with more props being planned. The fire officer leads the training activity, trains coaches, and performs professional certification evaluations. The training facility and the fire program is now used by more than ten fire departments from around the county and neighboring counties.

The use of professional journals was identified as a best practice by study participants. In one interview, a 28-year fire chief indicated that he read 12 trade magazines or professional journals. The interview with the chief was conducted in a meeting area of a fire station. In the area of the interview were eight journals addressing fire service topics. In another room, there were many more professional magazines and textbooks.

In another example, a fire chief stated that "he read approximately 12 periodicals and journals." Where the actual interview was physically situated, the researcher counted eight titles of journals visible from where he was sitting. In another room attached to the room where the interview was conducted, there were several other journals. Clearly, what the fire chief said and the physical evidence agreed.

In one interview, a fire chief with 12 years service discussed the safety of the fire fighters in his fire department. Before the interview began, he indicated that he was in the process of purchasing a newer pumper truck that would allow responding fire fighters to ride the truck in an enclosed, seated position with seat belts fastened. He indicated that he had been searching for a truck for some time and that he had found, through contacts in the fire service and the Internet, an acceptable truck in Florida. During the interview, his cellular phone rang. He said he needed to take the call. A fire officer from the department that had the pumper truck was calling to provide additional information to

the Montana fire chief. The Internet and a network of peers were identified in the data from the survey as valuable learning sources.

Another fire chief with 25 years service indicated in her interview that she learned from attending courses in Montana sponsored by MFSTS. She also indicated that attending courses with speakers like Phoenix Fire Chief Alan Brunacini was useful for her. She also noted that attending those courses with other members of her fire department was particularly productive. The interview with the fire chief took place on a Monday. The previous two days, she had attended a Command and Leadership conference presented by Alan Brunacini and sponsored by MFSTS. Attending with the chief were three other members of her fire department. The chief has attended more than 20 other courses sponsored by MFSTS in the past ten years. There was strong support for the opportunities provided by MFSTS.

A fire officer with 20 years service indicated during his interview that he read a great deal of material. He said that he used the MFSTS Resource Center as a source for gathering learning material. When he was contacted to arrange his interview, he indicated that he would like to conduct the interview at the MFSTS facility in Great Falls as he was planning to be there to look for some reference material. Before and after the interview, the fire officer used the personnel and materials from the Resource Center to gather information.

Further evidence of the role of the MFSTS was evidenced by the fire chief who met to participate in the study as he was attending a statewide fire service organization meeting in which he serves on the executive board. Later he was going to attend a two-

day fire service course sponsored by MFSTS. Four other members of his fire department accompanied the chief on the trip.

Many of the study participants mentioned technology as a learning source. The technology utilized by the study participants ranged from hand-built fire trucks to advanced hand-held thermal imaging equipment. Some of the technology was long standing, such as the design of the fire station.

In one case the fire department had several generations of the same technology. The fire department had a fire truck equipped with a compressed air foam system built by the fire fighters in 1989. In 1989, the Montana Fire Services Training School hosted the first compressed air foam system course in Montana. Members of the fire department were at the class, brought the ideas home to their fire department, and shortly after the class built a fire truck equipped with a compressed air foam system.

In 2003, the same fire department had taken delivery of a new fire truck equipped with a modern compressed air foam system. The technology had become more reliable, more effective, and simpler to operate during the intervening 14 years. The members of the fire department were excited to have the new generation of the technology, and were well into their training regimen with the new truck.

After interviewing the fire chief of the department, the researcher looked at both generations of fire trucks. Data from the interview revealed that the fire chief had mentioned looking for new technology such as the new truck and the improvements that came with the new generation of the technology. The answers the fire chief gave to the interview questions were in agreement with several generations of the physical assets owned and operated by the fire department.

Another study participant made several strong statements about the usefulness of training as a learning action and a learning source. The fire chief said that his fire department trained in a way that closely matched the way the fire department expected to operate on incidents. He went on to say that the fire department's training facilities were designed to re-create the challenges offered by the structures in the fire department's service area.

This fire department did have a training facility that was used regularly for training fire fighters to fight fires in structures. The training structure was, in fact, built to re-create the challenges found in structures in areas serviced by the fire department. More specifically, the area that the fire department serves gets considerable snow accumulation. The structures in the area have steep pitch roofs to shed the snow. Operating on a steep-pitched roof is a specific challenge. The training building built by the fire department has a roof training prop that can be configured to a steep pitch. The fire department has specific operating procedures and technology for operating on a steep-pitched roof. The fire department routinely trained on the steep-pitched roof prop using the technology and procedures for that task.

The statement, facilities, technology, and procedures related to the reality level of the training in that fire department all matched. What the fire department personnel did as a routine matter was what the fire chief represented about the fire department in the data he provided in the study.

Every study participant offered data that was consistent with the artifacts observed by the researcher and these data were representative of the role and rank they

played in their fire department. The artifacts that the researcher observed were representative of those useful in preparing a safe and competent work force.

Summary of Findings

The data gathered from the Rating of Learning Sources Instrument, analysis of artifacts, and the interview questions clearly shows that the study participants were actively involved in learning. The study participants read journals, periodicals, texts, or electronic newsletters. Every study participant enrolled in workshops or courses, engaged in networking with other members of the fire service, and observed the deployment operations of their fire departments and fire fighters as a learning source. The responses to the interview questions left a clear impression that the participants in this study were learning and were doing so based on internal motivation. The study participants indicated that they learned by their choice and in ways and from sources of their choosing. No study participant indicated that they were learning to comply with any mandate other than their personal desire to learn. In terms of learning actions and sources, there was little difference in participant responses when compared to demographic profiles. For example, there was little difference in participant responses based on the size of the population and area served. When responses were compared based on age, rank and role, or years of service and rank and role, there was little difference in responses. Volunteering to serve in the community or being paid to serve did not affect participant responses.

The data provided by the study participants in response to the seven open-ended questions used in the interview were descriptive, detailed, and rich in context. The study participants shared several characteristics across roles and rank. All of the study participants represented themselves as problem solvers and were interested in preventing bad things from happening in their communities, in their fire departments, and to their fire fighters. All were equally interested in causing good things to happen to the same groups. The study participants shared a strong commitment to quality customer service for both internal and external customers, were active listeners, and were consciously-open-minded.

The study participants repeatedly demonstrated their commitment to using best practices in preparing a safe and competent workforce. Their commitment, by thoughts, words and actions, was consistent through the artifact analysis, the results of the Rating of Learning Sources Instrument, and the responses to the interview questions.

Four areas of learning sources and learning actions emerged as common themes through the interviews. Those four areas were:

1. Participation in networking with other fire fighters
2. Observation of fire fighters during training and drills and during incidents and responses
3. Seeking information from incident after action reports, research reports, and incident critiques
4. Use of staff, courses, educational products and the Resources Center provided by the Montana Fire Services Training School.

Through the analysis of data gathered in the study, it became apparent that the relationship between learning sources and learning actions was complimentary. For example, many participants identified networking as a primary learning action and other fire fighters as a primary learning source. Many of the participants actually indicated the learning action/learning source hybrid of networking with other fire fighters as a critical part of their learning.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The researcher used a select group of 19 Montana fire fighters identified as using best practices in preparing a safe and competent workforce to ascertain the learning sources and actions they used. The Director and staff of Fire Services Training for Montana and the members of the Advisory Council for MSU ES Fire Services Training School selected the study group members. Data collection occurred on-site and data collection methods included interviews, written completion of a survey instrument, and the study of artifacts. Data analysis included the identification, recognition and description of the learning actions, and sources by which fire fighters (study participants) go about learning new skills, effective methods, and innovations and how they deal with change.

Analysis of the data was used to answer four research questions. These questions sought to identify: where fire fighters using best practices first receive information regarding effective methods or innovations; those sources used most by fire fighters to obtain information about effective methods and innovations; those sources that were the most relevant to fire fighters who were recognized as using best practices; and those learning actions taken by fire fighters to prepare a safe and competent work force.

Discussion of Findings

The study participants were adults involved in the fire service in Montana. The data gathered from the Rating of Learning Sources Instrument, analysis of artifacts, and the interview questions clearly shows that the participants were actively involved in learning. The study participants read journals, periodicals, texts, or electronic newsletters, are enrolled in workshops or courses, and are actively engaged in networking with other members of the fire service. Every study participant observed the deployment operations of their fire departments and fire fighters as a learning source. The responses to the interview questions left a clear impression that the participants in this study were learning and were doing so based on internal motivation. The study participants indicated that they learned by choice and in ways and from sources of their choosing. No study participant indicated they were learning to comply with any mandate other than their personal desire to learn. Imel (1994) citing Rogers (1989) states, "The adults did not have to be there: if the class was disagreeable, they could simply stop coming. In teaching [adults], the customer, not the subject, comes first and is always right, and the customer is the learner" (p. 1). Imel (1994) goes on to cite Knowles, 1984, addressing several assumptions about adults as learners, "Adults tend to be self-directing; adults have a rich reservoir of experience that can serve as a resource for learning..." (p. 3). The data from the study indicate that the participants shared these characteristics of adult learners.

Several significant findings came from the interview questions. First, the learning sources and learning actions used by fire fighters in Montana who were recognized as

using best practices in preparing a safe and competent workforce were similar among the study participants. Every participant indicated on the Rating of Learning Sources Instrument that they frequently used other members of the fire service as a learning source. Similarly, each study participant frequently mentioned using contacts or networking with other members of the fire service as a learning source. Many indicated that they frequently used other members of the fire service who were in similar circumstances as learning sources and learning actions. Study participants indicated that other members of the fire service included fire fighters from states other than Montana. Many participants mentioned members of the Phoenix, Arizona fire department as learning sources.

An analysis of responses to the interview questions reveals that many study participants used members of the MFSTS as learning sources. Other study participants indicated that they used MFSTS staff members as initial points of referral to other members of the fire service who may have had information that would be useful to the participant. The study participants indicated that the MFSTS Resource Center was used frequently as were the courses offered, and the consultancy process provided by MFSTS staff. The findings support the efforts of the MFSTS to provide educational products and services. It is readily apparent, based on the data from the study, that the MFSTS should continue to deliver the products and services in the configuration in which they have been delivered.

Each study participant indicated on the Rating of Sources Instrument that they used incidents/responses and training/drills as a source of learning. Study participants indicated that observing fire fighters during periods of deployment provided valuable

insight into the effectiveness of their training programs and was an accurate indicator of the state of preparedness of the fire fighters. Study participants also indicated that they gained useful understanding of the interaction between fire fighters and various fire fighting technologies and customers.

An analysis of the data from the Rating of Sources Instrument provided several significant findings. The learning sources most frequently used by the participants included public consultants (MFSTS), the Internet (including the MFSTS e-mail newsletter and other lists), the MFSTS Resource Center, other members of the fire service, fire service classes in Montana put on by MFSTS, incident/responses, and training/drills. The learning actions having the highest relevance for participants included networking with other fire fighters and peers (including MFSTS staff), observing other fire departments, reading texts, periodicals, and electronic newsletter (including the MFSTS Resource Center), trying ideas in training and during incident responses, and feedback from actual service delivery.

The analysis of artifacts provided additional verification of the results of the interviews and Rating of Sources Instrument. The media documents provided include electronic newsletters, magazines, books, and videos. This supports what was identified from the Rating of Learning Sources Instrument about the importance of journals, periodicals, texts, or electronic newsletters. Other physical evidence included the equipment used to fight fires where it was state of the art.

The study participants indicated they used many learning sources. Further, they indicated that they used information from these sources to address issues that were meaningful to them in their fire departments. Several participants indicated that they

used information from other fire fighters and fire departments which lead to changes in their own organizations. Those changes were tried out in a training setting, then at incident responses, evaluated and refined. The approach taken by the study participants is supported by Imel (2000) when she states,

> A clear relationship exists between the change process and adult learning. Taking action related to a new mental concept or to organizational change will increase the flow of information surrounding it and allow those involved to test it out, receive reaction to it, and involve others in learning about it (p. 3).

While the demographic profiles of the study participants varied greatly, the data provided by the participants was consistent. The data from the study indicated that many of the study participants use learning sources and learning actions to address specific opportunities or problems facing the participant or the community they serve. The data further indicated that the learning took place in settings that are informal, rather than in the school or university setting. The data also shows that study participants use their experience and the experience of other members of the fire service as a basis for some of their learning. All of these data are consistent with the current adult education literature that supports the idea that adults learn in a variety of ways. Kerka (citing Draper, 1998; Sipe, 2001; Tice, 1997; Titmus, 1999) addresses some of the common characteristics of adult learning when she states:

> Theories or perspectives on adult learning, such as andragogy, make a number of assertions about the characteristics of adults as learners: adults need learning to be meaningful; they are autonomous, independent, and self directed; prior experiences are a rich learning resource; their readiness to learn is associated with a transition point or a need to perform a task; their orientation is centered on problems, not content; they are intrinsically motivated; their participation in learning is voluntary (2002, p.1).

Many participants indicated that they learned using multiple sources combined with their experience. They further indicated that the learning was continuous and ongoing based on a system of trial and refinement. Kerka (1997) cites Johnson and Thomas (1994), and Billet (1996) supporting this learning process, "Instead of absorbing or passively receiving objective knowledge that is 'out there,' learners actively construct knowledge by integrating new information and experiences into what they have previously come to understand, revising and reinterpreting old knowledge in order to reconcile it with the new" (p. 1).

The study participants indicated that they were aware of the value of learning. Based on the responses to the interview questions, several study participants indicated that they were active and aware of the learning action of being open-minded and receptive to learning opportunities. Further, many indicated that they thought about what they did in the practice of their field and used that reflection to shape current and future learning actions. Study participants indicated that they were in a constant state of learning from their experiences and that they learned regularly from the practice of their work, as a result learning evolved as their experiences and perspectives evolved.

Conclusions and Recommendations

Conclusions

Based on the findings from the study and the review of literature, the adult learners who participated in this study were not unique in the learning actions they indicated they used, because they used a wide variety of learning actions and learning sources.

1. The observation of training/practices and incidents/responses is a key learning action and was universal among all study participants.
2. Use of the educational products and services offered by the MFSTS is a useful or effective learning action for this group.
3. Participation in the networking process was a learning action universally used by all study participants.

Educational products and services were the primary resources identified by study participants as being highly relevant and frequently used.

1. The MFSTS is a valuable source for many reasons. The resource center provides texts, periodicals, video and audiotapes. The MFSTS serves as a public consultancy group for fire fighters. The MFSTS has the largest resource center of fire fighting information in the state and offers a variety of avenues for access including courses and an electronic/printed newsletter.
2. Peers and other fire/fighters were identified as being primary sources.
3. The application of the work by fire fighters either by practice or incident responses was a highly relevant learning source identified by study participants.

Recommendations for Action

Based on the study results and conclusions, recommendations are made for action and for further research.

1. The MFSTS should continue to deliver the educational products and services it currently offers. From the adult learner customers may come additional

indications of preferred changes or additions to the existing blend of educational products and services offered by the MFSTS.

2. The MFSTS should seek ways to develop and support the networking learning action that the participants universally indicated as a frequently used and relevant learning source. This should include determining how they identify and connect with other adult learners who share current issues and opportunities.
3. The MFSTS personnel should seek to develop means that support adult learners in the fire service in Montana to improve their ability to observe their fire departments during training and incidents. Among study participants, the learning action of observation of fire departments and fire fighters during deployment was a relevant and frequently used source of learning.
4. Fire service educators should build curricula that address the learning sources and learning actions used by the prospective fire service learners. Study participants indicated that they learn a lot from watching fire fighters in both practice and response settings.
5. Fire service educators, in collaboration with accomplished fire service practitioners, should develop performance benchmarks for training and responses to assist practitioners in their observations. Those benchmarks could start with a general description of the work for activities that are common in their area. Following a general description of the work, the benchmarks could include standard safety quality indicators such as safe driving. It would be useful to publish those benchmarking products using newsletters and journals, as well as personal contact using MFSTS staff.

6. Fire fighters should be encouraged to write down the results of their experiences that add to the depth of understanding of the services provided by fire fighters. The testimonials could also be published in various media. Fire fighters with work and learning experiences can contribute to case studies that can be shared by other fire fighters. The case studies could include a description of the situation of problem faced, ideas for implementation and feedback from training and application by fire fighters. The case studies could be recorded on DVD and distributed at fire fighter courses and through the MFSTS Resource Center.
7. Fire service educators should consider offering forums that focus on the interactions between fire fighters. Forums could occur in local areas with facilitation by staff from MFSTS. The content of the forum could be determined by the participants and supplemented with information from other forums provided by staff from MFSTS. These forums could take on a continuing approach that created opportunities for fire fighters to gather and learn from each other over time. This would support the need for continuing input regarding issues facing fire fighters as well as offer the opportunity for fire fighters to share new challenges and solutions.
8. In a facilitation role, the MFSTS could publish stories about fire fighters using best practices in preparing a safe and competent workforce. Those stories could include a brief interview with the fire fighters describing what they are doing and why, and a discussion of learning sources that were useful in the learning associated with the best practice. The stories could also include a set of contact information for the fire fighter using best practices so that interested fire fighters

could contact the featured fire fighter directly.

Recommendations for Research

1. In Montana there are fire fighters who are not using best practices in preparing a safe and competent work force. Further research could focus on finding and understanding those fire fighters who are not currently using best practices and seeking to understand what barriers are in place that are keeping them from using best practices.
2. Further research could identify and describe the characteristics of successful educational products and services that are specific to the fire fighter.
3. Since networking was a key learning action and fire fighters were a key learning source attached to it, a study should be completed that delineates how networking could be enhanced.
4. The MFSTS plays a very relevant and important role in providing resources to Montana's fire fighters. Further research should be completed to identify how the MFSTS could integrate, establish, or enhance their learning actions or sources.

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APPENDICES

APPENDIX A

RATING OF SOURCES SURVEY INSTRUMENT

Questionnaire

Introduction:

I am working on a project to improve fire services training for fire fighters in Montana. You have been identified as a fire fighter using best practices in preparing a safe and competent workforce. I would like to ask you a few questions about the learning actions you undertake and sources you use to learn about new methods and innovations in the fire service.

A note regarding your privacy:

The demographic information requested in Part 1 would be used as context for the data you provide for this study. Your name, address and phone number will not be connected with any other data you provide. The data and the data collection instruments (this questionnaire, the researcher's notes, and video recordings) will be held by the researcher or returned to the participant after the study has concluded.

Directions:

Please review the items listed below. Prior to the interview, please complete Part 1 and Part 2 of this questionnaire. The information in Part 1 and Part 2 will be used to illuminate and add context to the responses you offer.

Part 3 of the questionnaire lists the questions I will be asking you during the interview. The objective of the interview is to have you provide insight into learning actions and sources you use. You may or may not choose to review the questions prior to the interview. You may or may not choose to prepare written responses. Whatever degree of preparation you choose prior to the interview is acceptable. Please do what you are most comfortable doing prior to the interview.

If you need additional information or have any questions, please contact the researcher at 406-585-1103.

Part 1 - Demographics

Please print or type your answers

Name:
Address:
Phone #
Date of interview:

1. Age____
2. Last year of school or degree earned_____
3. Role and or rank in the fire service organization_____
4. Years in current role or rank_____
5. Total years fire service experience_____
6. Pop of community served by FD_____
7. Area of community served by FD_____
8. Number of response per year_____
9. Number of fire fighters who volunteer to serve_____ Number of fire fighters who are paid____
10. Types of services offered by FD (please circle all that apply)
    - Fire
    - EMS
    - Rescue
    - Prevention
    - Community Outreach (CERT, Community CPR, other)
    - Others (please list)

    _____
11. Do you own or have use of the following: (Please circle Yes or No, circle all that apply)
    - A computer Yes / No
    - E-mail Yes / No
    - Internet Yes / No
    - Text pager Yes / No
    - Two way pager Yes / No

12. How many fire service periodicals and professional journals do you subscribe to or regularly read? _____

Part 2 - Rating of Sources

Please rate the following sources of information regarding effective fire service methods or innovations in terms of the frequency with which you use them and the relevance of the source. Please circle the number (1[least] - 5[most]) that most closely represents the degree to which you rate the listed sources in terms of frequency of use and relevance. If you use sources that are not listed below, please add them in the space provided next to the items titled "Other" and circle the frequency of use and relevance of the source you have identified.

	Frequency of use of source						Relevance of source				
	No use		Some use		Frequent use		None		Some		Highly
	1	2	3	4	5		1	2	3	4	5
Consultants											
Private	1	2	3	4	5		1	2	3	4	5
Public (MFSTS,	1	2	3	4	5		1	2	3	4	5
Magazines/Professional Journals	1	2	3	4	5		1	2	3	4	5
Texts	1	2	3	4	5		1	2	3	4	5
Videos	1	2	3	4	5		1	2	3	4	5
Video Conferencing	1	2	3	4	5		1	2	3	4	5
Satellite programs (FEMA, others	1	2	3	4	5		1	2	3	4	5
Internet (The Latest, Other lists, etc)	1	2	3	4	5		1	2	3	4	5
MFSTS Resource Center	1	2	3	4	5		1	2	3	4	5
NFPA Standards	1	2	3	4	5		1	2	3	4	5
Other members of the fire service	1	2	3	4	5		1	2	3	4	5
Fire Service Classes in MT by MFSTS	1	2	3	4	5		1	2	3	4	5
Other Fire Service Classes in MT	1	2	3	4	5		1	2	3	4	5
Fire Service classes outside MT	1	2	3	4	5		1	2	3	4	5
General (non-fire) classes in MT	1	2	3	4	5		1	2	3	4	5
General (non-fire) classes outside MT	1	2	3	4	5		1	2	3	4	5
Friends not in fire service	1	2	3	4	5		1	2	3	4	5
Fire Service Professional org	1	2	3	4	5		1	2	3	4	5
Allied professionals (such as financial institutions [public and private], engineers, attorneys, planners, inspectors, etc)	1	2	3	4	5		1	2	3	4	5
Training/Drills	1	2	3	4	5		1	2	3	4	5
Incidents/Responses	1	2	3	4	5		1	2	3	4	5
If you use or find relevant sources not listed above, please list them below, and rate them in terms of frequency of use and relevance											
Other	1	2	3	4	5		1	2	3	4	5
Other	1	2	3	4	5		1	2	3	4	5
Other	1	2	3	4	5		1	2	3	4	5

Part 3 - Interview Questions - (Date of interview ___/___/___)

Check when completed:

__ Brief participant on the purpose of the study and interview
__ Describe the methods used to record the interview and the later use of the data gathered. Ask for permission to use the participant's data.

Question Set 1.

Q1a. How, in your opinion, has the fire service changed over the past 5 years?

Q1b. As a member of the fire service, what effective methods or innovations have you used within your fire department in the past 5 years that you feel have improved your fire department and community?

Question Set 2.

Q2a. What learning actions did you take that resulted in your becoming aware of these changes, effective methods, or innovations?

Q2b. How did you become aware of these changes, effective methods, or innovations?

Question Set 3.

Q3a. What sources did you use to gain additional information about these changes, effective methods, or innovations?

Question Set 4.

Q4a. What future changes do you foresee for the fire service?

Q4b. What learning actions will you take to assure that you are aware of changes, effective methods, or innovations?

APPENDIX B

SELECTION CRITERIA FOR FIRE FIGHTER STUDY PARTICIPANTS

Selection Criteria

1. Montana fire fighter
2. Must have been actively involved in fire fighting for 5 years
3. Must be technically competent and a sound decision maker
4. Must use best practices including those related to fire fighter safety
5. Must be a fire fighter with a public, local government fire department in Montana
6. Must be between the ages of 23 and 75 years of age

APPENDIX C

MONTANA COUNTY MAP


LINCOLN
FLATHEAD
1
GLACIER
TOOLE
LIBERTY
HILL
BLAINE
PHILLIPS
VALLEY
1
DANIELS
1
SHERIDAN
ROOSEVELT
1
PONDERA
SANDERS
LAKE
TETON
CHOUTEAU
RICHLAND
MCCONE
DAWSON
LEWIS
AND
CLARK
1
CASCADE
3
FERGUS
GARFIELD
MINERAL
MISSOULA
2
PETROLEUM
JUDITH
BASIN
PRAIRIE
WIBAUX
GRANITE
POWELL
MEAGHER
WHEATLAND
GOLDEN
VALLEY
MUSSELSHELL
3
RAVALLI
BROAD-
WATER
DEER
LODGE
1
JEFFERSON
SILVER
BOW
1
GALLATIN
SWEETGRASS
STILL-
WATER
1
YELLOWSTONE
1
TREASURE
ROSEBUD
CUSTER
FALLON
2
PARK
BEAVERHEAD
MADISON
CARBON
BIG HORN
POWDER
RIVER
CARTER

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