FIRE AND EMERGENCY MEDICAL SERVICES

ADAPTIVE CAPACITY: A CONTENT ANALYSIS OF

TRAINING AND EDUCATION PROVISION IN COLORADO

By

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Abstract: This study analyzes adaptive capacity in regard to training and education of firefighters
and EMS providers in Colorado. Adaptability is required for successful careers of public safety
practitioners, but it is commonly acquired through experience and passed down knowledge of
those who have been in the field for some time. The problem in lies that there is both a decrease
of applicants into the field and more of the experienced practitioners are leaving as well. Creating
a gap in institutional knowledge.

A semi-structured interview was conducted with firefighters and EMS providers, various levels of
management of public safety entities, and educators to gain insight of various organizations entry
level education and training for new recruits in attempt to close the gap of expert institutional
knowledge from someone just starting their career.

Recommendations are made for policy change for both public safety organizations and
educational programs with a large focus on how training and learning is performed. Developing a
culture of being 'change positive' and a thirst for knowledge so that practitioners of all levels
continue to learn. That new ideas are accepted so that the outcome is a positive one.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Public safety is a staple of any modern civilization. Firefighters and Emergency Medical

Technician's (EMTs) perform a plethora of tasks every day to assist and aid the community for

which they serve. Some easy and routine, and some become more elaborate as a situation grows

in complexity. The choice to begin a career in the profession is not an easy one to make, but in

the end a career can last decades if one so chooses. After the September 11th attacks, there were

thousands of individuals who were lined up wanting to test and interview for a civil service

career. As of recently, there has been a noticeable decline in those who are wanting to take on the

challenge of being a first responder (Vock, 2021).

As this trend continues, there will be less and less institutional knowledge to be passed

along to newer members. Knowledge from experienced, senior members in each role passing

what they have gained (knowledge, tips, tricks, etc.) through experience to the next person

(applies not only to new recruits, but as those who promote as well) (Graham, 2021). The author,

at the time of this paper, has accrued sixteen years within the firefighting and EMS professions.

The ability to adapt to various situations often comes through experience as one grows in their

career and guidance from the 'senior' members of the organization (Rowett, 2017). However, if

more of them are retiring from the job than applying, the institutional knowledge base

decreases as well. That knowledge is a "large bundle" of "invaluable business and operation knowledge, as well as organizational and political contacts and connections" (Heightman, 2017). Firefighters, EMTs, and police officers all receive entry level training followed up with competency evaluations through physical and written tests. Upon being hired at an organization, there is some sort of training that can last a couple weeks or some programs as long as three-years. In that process various aspects of not only how to conduct oneself on responses, but operational and technical aspects of the job are passed along. But if the institutional knowledge base is decreasing; then, who will help guide new recruits? Potentially it maybe someone who also has limited experience. This is prevalent within small, rural and/or volunteer organizations that feel the understaffing greater than those of major metropolitan organizations (van der Feyst, 2020).

Entry level education into public safety has been standardized nationally. Firefighting education is informed by the National Fire Protection Agency's (NFPA) standards (2019), and Emergency Medical Services (EMS) by the National Highway Traffic Safety Board (2021). After completion of the initial training, evaluation for certification is typically left up to either the state and/or county which the practitioner plans to work. Having standardization is helpful, but at the same time a hinderance since then practice needs to be modified for the local area. Paramedics in the Rocky Mountains do not have to respond to ocean related incidents, and similarly those practicing along the ocean's coasts do not experience high altitude related illnesses.

No two responses are likely to be the same, while most will have common patterns and themes there will be time that practitioners run into situations they have not encountered or reviewed before. First responders' decision making is often fluid in nature (Reay, 2018). Though protocols and Standard Operating Procedures (SOPs) exist as guiding documents, they do not typically account for the minute details; details that can sometimes make the difference between a life saved versus lost. The ability to adapt (or adaptative capacity) to various situations is crucial

for successful mission outcome. "Adaptative capacity is the arrangements and processes that enable adjustment through learning, adaptation and transformation" (Parsons et al., 2021). Is there a way to help new practitioners increase their ability to adapt, to respond and think about all the aspects of a response with limited experience so that responses are successful?

This gap can create safety concerns for both responders and the public. Another example is that when firefighters receive tones for a reported structure fire, they must leave the station within sixty to ninety seconds. In an urban setting, the initial engine company is on the scene within four to five minutes from leaving the station. The priority is to save and extricate any savable lives from the structure. This process, according to Ye et al. (2022, p1), is arduous, hostile, chaotic, causing extensive physical and mental pressures on firefighters all while in an unfamiliar environment, and in turn can create a safety concern. The expectation of knowledge and experience is beyond measure from the public since they are expecting a top-quality product every time someone calls 911 (Eyre, 2018, p44). Usually, not much consideration is given by the public if it is the first day of a new employee's career or their last after decades of service, they expect the outcome to be the same regardless.

Researcher Background and Motivation

The researcher first began graduate school spring semester 2020 at Oklahoma State University in their Fire and Emergency Management Administration program, while working full time as a fire department company officer. During the early years of this career, two undergraduate degrees were completed; including an Associates of Applied Science in Paramedicine and a Bachelor of Science in Public Safety and Emergency Management Administration. In addition, time has been spent working in both EMS and entry level firefighter education, along with teaching public first aid, CPR, and fire safety type classes. Having over a decade of experience as both a practitioner and an instructor revealed that there is a gap between

completing the entry level education and practitioner proficiency. In personal experience as both an instructor and a commanding officer, it takes on average a year or two to become proficient in delivery and begin mastery of certain skills. Even though initial training of some aspects (i.e. technical rescue) is extensive, the problem in lies that there are low number of occurrences. Therefore, the small details (that can be the difference between successful versus a poor outcome) during responses are sometimes forgotten. Also, the training environment is "controlled" and "safe," which does not always translate to direct, real-world application (Lloyd, 2005, p85).

Motivation for the study is based off the years of experience of the researcher both as a practitioner and as an educator. Through experience the passing of institutional knowledge from senior personnel to new recruits happens over time with running responses and continual training, but even those who have response and operational knowhow need continual experience (i.e responding on emergencies) and training as well. Experience, mentoring, and training increases an individual's adaptive capacity, from which they have added tools and knowledge to utilize on responses. But without constant review and training, failure of a task can still happen. While this study was conducted, the researcher (and other practitioners from surrounding fire departments) were part of a simulated trench collapse with a person trapped. Much review had not been conducted by the researcher (or the others present) on the topic since the year prior, therefore causing a delay because a review of the skills and technicalities about the operation had to take place first. It took approximately an hour to make the area of the simulated rescue safe so that operations in the trench could be conducted, whereas the expectation is to have it secured within fifteen minutes.

Research Aim

Emergency service providers come out of their primary training with a foundational, general knowledge, and it is often said that there is a difference of knowledge between practitioners who have 'street' experience versus solely having 'book' knowledge. Practitioners often are required to adapt how they respond to various situations, which in turn can be problematic for the unprepared. Therefore, this study's aim is to

"Define a process to decrease a gap in institutional knowledge and increase adaptative capacity for new recruits of public safety organizations."

Research Objectives

1. Write a literature review on adaptability, public safety education, and emergency service delivery.
2. Construct a purposive sample frame of practitioners and administrators of various emergency response organizations.
3. Complete a schedule of semi-structured qualitative interviews with the sample frame.
4. Analyze the qualitative data utilizing computer-assisted content analysis (*Atlas.ti*).
5. Formulate recommendations for theory, policy, and practice development to minimize the knowledge gap.

CHAPTER II

LITERATURE REVIEW

The literature review is a process in which is seeking information about the topic in question; to see if there has been research and theory developed or discovered. Whether prior literature and research has been conducted prior to the current study, the additional study can help aid and provide further discovery. The review can also help guide the researchers of the current study of which questions to ask, what data to collect, and help develop methods as well. This study's focus was centered around the theme of adaptability within the public service setting. More specifically can adaptive capacity and institutional knowledge be taught so that first responders have a stronger knowledge base and skill set earlier on in their career?

A thorough review was conducted reviewing the ability for humans to adapt, entry level public safety education regarding adaptability within the primary education, and public safety delivery and training with a focus on developing adaptability. Searches for literature included databases of Oklahoma State Library, Scopus, FRAMES and Google Scholar. Terms used in databases were *first responder adaptability, human adaptability, emergency service delivery, emergency service response models, emergency service education, emergency service education delivery, emergency service training*. Followed up with, the cited resources of

found literature were reviewed for additional sources as well. In addition to reviewing literature, direct sources such as education standards and local standard operating procedures were reviewed. *Atlas.ti* was utilized for content analysis of the found documents. Once uploaded, a review of the most common terms was reviewed from the program's produced cloud word. The papers were grouped into the three main aspects of the study including: adaptability, education, and delivery. The code words used to review the documents and find quotes included *adaptability, characteristics, communication, development, education, emergency, knowledge, management, performance, planning, and response*.

The first section reviewed adaptability itself, including workplace adaptability. Followed by a review of EMS and firefighter entry level education standards. Finally, various response models of public safety organizations.

Adaptability

An organism's need to change has been evident since before written history. From various disasters to the extremes of climates, humans have adapted to various situations and environments over the millennia (McElroy, 2018), even more so over the last few centuries (Sample et al., 2022, p5). Adaptability is crucial not only for basic survival, but is necessary for successful outcomes in the world of public safety. In O'Connell, McNeely, & Hall (2008, p249), they state that the skill is important for "dealing with uncertainty and stress, and in working outside traditional temporal and geographic boundaries." The idea of adaptability first dates to 1896, and that the "driver" of adaptability and evolution was introduced by Wyles et al. (1983) building on Darwin's theory (Bateson, 2018, p2-3) (McElroy, 2018, p1). The "mantra" *improvise, adapt, and overcome* used within the United States Marine Corps has translated over to public safety (Keenan, 2017, p4). Given that research is relatively new in the field, there has been little analysis as to how adaptability happens, just that it does exist (Boyd, R., & Richardson, 1995).

Also, because the word 'adaptation' is tough to define, as it is used both for the method and the outcome (Hutcheon and O'Flynn, 2013, p11). McElroy (2018, p1) stated that the "four main dimensions of adaptability [are]: adaptation, accommodation, plasticity, and resilience" (See Table 2.1).

Regardless of the amount of written knowledge about the topic, first responders face all four of the dimensions within their line of work. They must be able to 'adapt and overcome' because the end goal of protecting and saving the lives sworn to protect has remained the same, but the tools and strategies have changed long since the days of the Bucket Brigade.

Type	Definition
Adaptation	Responses where the benefit outweighs the risk (technology, modern medicine, etc.)
Accommodation	Tradeoffs. Give and take
Plasticity	Biological/physiological changes (both acute and long term)
Resilience	Ability to utilize resources to overcome difficulty

Table 2.1: Dimensions of Adaptability (McElroy, 2018, p1-2)

In O'Connell, McNeely, & Hall (2008, p249), adaptability has both been seen as inherent, while others believe how it is a skill that can be taught and increased. Figure 2.1 shows the various aspects of personal adaptability including individual characteristics, human capital factors, and the work environment. Under the individual characteristics, age, gender, and race are listed. At first, the authors hypothesize that with an increase in age will mean a decrease in the willingness to change (2008, p250). That most of the adaptability comes from human capital, which is comprised of the "work experience, education, knowledge, skills, abilities, and training" (2008, p250). They state that formal education helps increase an individual's capacity to deal with

various situations and circumstances (2008, p250). O'Connell, McNeely, & Hall conclude that workplace adaptability is the responsibility of not only the individual, but the manager as well. Tasking them with not only support in the workplace, but seeking additional education as well (2008, p257).

The National Wildfire Coordinating Group (NCWG) produces trainings titled "6 Minutes for Safety." These trainings, or briefs, are geared for wildland firefighters taking a few minutes in the morning to review the topic and have a discussion between the crew and leadership. The August 2021 brief was reviewing what makes a firefighter successful at adapting or having flexibility and listed these points:

- Recognize and acknowledge change

- Anticipate problems by utilizing the risk management assessment

- Determine if a standard operating procedure is appropriate

- Interact constructively with others

- Maintain the even strain – know those that can't

Followed up with discussion points for the crew to review included asking how and when is a time to be flexible or adaptable? Hence requiring some of the participants to have knowledge and experience to help make sure the discussion is fruitful.

Adaptability is in simple terms a choice, answering how to proceed with the next step/decision to make based off current and possible forecasted factors. Leotti & Delgado (2011, p2-8) state that the idea of choice is biological in nature. The study notes that there is a need for control within the brain, and that making the right choice is physiologically rewarded. That having or wanting control of a choice increases adaptability within different psychosocial functions.
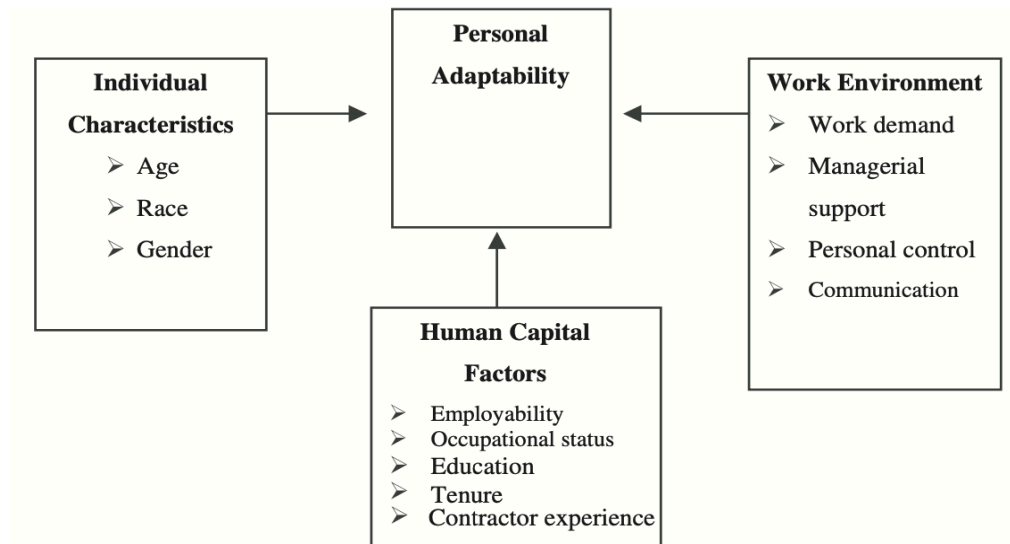
Figure 2.1: Personal Adaptability (O'Connell, McNeely, & Hall, 2008, p249)

Public Safety Education

Much like any other formal education, public safety education has set standards and expected to be proficient at required competences upon completion. Both firefighter and EMS provider education standards are written by national boards as a general basis. The National Fire Protection Agency (NFPA) writes codes for all aspects of the fire service, including job performance criteria for each level of certification. Each code has its own committee comprised of subject matter experts (Grant). NFPA Code 1001 (2019) is the Standard for Fire Fighter Professional Qualifications. It is the guiding document for entry level firefighter education. EMS Educational Standards are written by the National Highway Traffic Safety Administration (NHTSA).

NFPA 1001 outlines the skills and knowledge needed for both entry level firefighters and those who want to build their skill knowledge through the Firefighter I and II certifications. A search of the document using *adapt, modify, change, alter, and revise* only yielded one result.

Stating that the firefighter should be able to "modify water application for maximum penetration" (NFPA 1001: 4.3.8, 2019). No other mention of adaptability, instead the code uses direct terminology of how operations should be conducted. Commonly in addition to obtaining Firefighter I certification, knowledge to respond to hazardous material incidents is required too. Review of NFPA 1072 using the same search terms yielded no results.

NHTSA released their last EMS Educational Standards in 2021, which has greatly evolved from the original standards from the 1950's (NHTSA, 2021, p8). The document was reviewed as well as searched using the same terms as above with the following found:

- "…includes developing a list of differential diagnoses through clinical reasoning to modify the assessment and formulate a treatment plan" (p36)
- "…therapeutic communication and adaptive interview techniques" (p37)

While *revise*, when search, yielded many results; it was more in reference to how the standards have been 'revised' versus the actual education standards. Both results above were noted to be in the paramedic section of the standards. Entry level EMS education starts either as an Emergency Medical Responder (EMR) or Emergency Medical Technician (EMT), whereas the Paramedic level is considered an advanced level provider. Some paramedic programs require at least a year of steady experience as an EMT provider before being accepted.

The ability to adapt is expected as a requisite skill for the job. There is very minimal mention of it within the education standards let alone the requirement to teach the subject.

Emergency Service Delivery

Job descriptions and articles note the need for adaptability as a required trait/skill for public safety providers (Murphy, 2019). Rapp & Wilson (2022, p12), state that the ability to perform the job is linked to both adaptability and successful long-term planning for successful

mission outcomes. Standard Operating Procedures (SOPs) are guiding documents for common responses that a practitioner encounters to guide actions during responses (Harwood, 2017, p v). Since leadership and experienced practitioners understand that these documents do not always align with the response, SOPs often have the allowance of flexibility especially as a situation escalates and becomes more complex in nature (Massey, 2005, p30). Also given that "modern disasters… often manifest as complex systems—susceptible to nonlinear interactions and feedback in the environment" it creates outcomes that are unplanned (Harwood, 2017, p v). Practitioners do not have the luxury to take the time for a full comparative analysis, and decisions sometimes must be made quickly.

One significant time of SOP deviation and adaptation from SOPs is when the Federal Aviation's Administration National Operations Manager grounded all aircraft within the United States in 2001, when there was no such policy in place at the time (Harwood, 2017, p27). But also noted, is that the decision came an hour after the first building was struck, which in turn is believed to have sealed the fate of the other hijacked aircrafts. SOPs and strategy can vary from department to department for various reasons, which in turn if organizations have agreements to run responses in other jurisdictions it can create differences of opinion and sometimes conflicting in nature.

Complex situations are those that go above and beyond everyday responses. Instances that practitioners may run into unknown situations are the rarer events include pandemics, terrorism, major disasters with catastrophic loss of life and property destruction, hazardous materials incidents, complex technical rescue incidents, etc. SOGs reviewed from the researcher's home department using the same search terms as in the educational documents produced no results. The department is part of what is considered the 'North Area Fire Departments,' which is comprised all the fire departments that serve the north part of the Denver Metropolitan area. As a joint effort, there are common SOPs that standardize some operations like structure fires and

mass causality incidents. Using the same search terms modify and change were found collectively less than ten times. Most of them noting that that the change would be at the strategic level (incident commander) versus at the practitioner level.   In addition to, the documents used for a firefighter's first year of employment from the researcher's fire department were reviewed. The focus is on skill performance and efficacy versus teaching on the ability to adapt.

Research Question:

How do emergency service practitioners gain institutional knowledge to increase adaptive capacity?

The question is formed from years of practitioner experience, seeing, and experiencing the need to adapt. The concern and want to develop the theory are so that new practitioners do not have to repeat the mistakes of the past. That, in turn, they have successful and fruitful careers, they remain uninjured (both physically and mentally), and make positive impacts in the community.

CHAPTER III

METHODOLOGY

Since the world as it exists has many various views and aspects. Formal research is a what helps shape what is known. It, also, leads the way to what is to be discovered, and gives the world an understanding through definition. "Research is the process of collecting, analyzing, and interpreting data in order to understand a phenomenon" (Williams, 2007, p65). Giving focus to philosophy, collection methods, and methods of analysis not only help the researcher have a roadmap, but the readers as well to understand their logic. Paradigms including positivism, post-positivism, critical realism, interpretivism, and pragmatism (Bell, Bryman, & Harley, 2019, p 28-30). Adaptability is subjective by nature, so this study is informed by the interpretivist paradigm, and utilizes qualitative semi-structured interviews and content analysis (Bell, Bryman, & Harley, 2019, p 32).

Philosophy of Research

Various views of philosophy of research exist to help create a well-rounded view of the world as it exists. Some phenomena have basic casual relationships whereas others are more complex and require a more complex understanding, and utilizing the social sciences help define each of

them. As the world continues to change and evolve, how events and ideas are interpreted change as well. So "understanding paradigm- specific assumptions helps illuminate the quality of findings that support scientific studies and identify gaps in generating sound evidence" (Park, Konge, & Artino, 2020, p690). In Bell, Bryman, & Harley (2019, p25), the social sciences help understanding by breaking it into three different aspects:

1. Ontology: our understanding of what reality is
2. Epistemology: our understanding of how we can know reality
3. Methodology or research strategy: our understanding of the best way to do research given our ontological and epistemological assumptions

Dating back to the 17th Century, positivism is understanding the causal relationships between independent factors that in turn create a various outcome (or dependent variables) with no confounders (Park, Konge, & Artino, 2020, p690). The paradigm aligns with the hypothetico-deductive model of science (Park, Konge, & Artino, 2020, p690) (Bell, Bryman, & Harley, 2019, p23):

Theory → Hypothesis → Operationalizing Variables → Experimentation → Theory

Post-positivism takes the positivist view and adds an interpretivist approach (Panhwar, Ansari & Shah, 2017, p253). The research focuses on the experiences of the many and producing results on what is accepted all with the understanding "that the absolute truth is nowhere to be found" (Panhwar, Ansari & Shah, 2017, p253). It allows for further research to be conducted (Panhwar, Ansari & Shah, 2017, p258). In Wildemuth (1993), it is concluded that a combination of positivism mixed with interpretative was more efficient than using one versus the others to help answer the different research questions.

"Critical realism has been an important advance in social science methodology because it develops a qualitative theory of causality which avoids some of the pitfalls of empiricist theories of causality" (Roberts, 2014).   The concept of critical realism gives rationale for the social sciences to be empirical (Sayer, 2004, p15). It is more a "theory-neutral observation" that opposes positivism (Sayer, 2004, p16). That instead of "causal powers" (positivism) there are "causal mechanisms", which in turn translates to that there are layers to the world that can affect each other differently (Sayer, 2004, p19).

Interpretivism (or social construction) is how someone see's the world through their own eyes based off their life experiences (Hancock, 1999, p242). Since there are no laws that guide the "complex phenomena" that is the natural and social world, everyone has a different view and experience in life (Williams, 2000, p215). In fact, it is the opposite of positivism, and instead of trying to explain human behavior the idea is to understand "the how and the why of social action, including the processes whereby things happen" (Bell, Bryman, & Harley, 2019, p31)

Finally, pragmatism gives way to what works (Kaushik, V., & Walsh, 2019, p4). It gives "us a theory of meaning, a theory of truth, and a theory of knowledge; that it is trying to work out the theory of reality" (Pratt, 1909, p9). Instead of seeing knowledge as reality, pragmatism wants to improve one's existence (Kaushik & Walsh, 2019, p4). With a focus on the future, the use of pragmatism is heuristic (Kaushik & Walsh, 2019, p12). The authors note that since there are several ways to do research and debates of how to conduct research, this idea gives way to accepting change within the future. Which, in turn, holds true since everyone has a different set of experiences and values that they hold within them; that guide their lives.

Philosophy of the Study

1. Ontology: Adaptability is required for successful outcomes for public services practitioners, and successful adaptability requires institutional knowledge be passed to new practitioners

2. Epistemology: The knowledge has been gained from the 16 years of continuous experience

"The aim of understanding the subjective meanings of persons in studied domains is essential in the interpretive paradigm" (Goldkuhl, 2012, p4). Chowdhury (2014) states that interpretivism "adopt[s] the position that people's knowledge of reality is a social construction by human actors." The worlds of EMS and Firefighting are unique in nature. What is seen and experienced is unique to practitioners, and the public does not fully comprehend all the details of the career fields. Interpretivism is utilized in this study because the interview participants are those who have experience at various levels within the field, and gaining their opinion based on all their collective experience. The researcher's world view is (and has been) centred around public safety. Being a son of firefighters, the exposure of the industry dates to 1992. Seen through experience and the literature, adaptability is required for public safety practitioners to be successful. Given that, an interpretivism point of view is the philosophy of the study because of the exposure of the world as seen through not only the researcher's eyes, but of the eyes of generations before. The adage of adapt and overcome holds true to overcoming unknown situations.

System of Logic

Developed in 1956 by James D. Thompson, there are different systems of logic: deductive and inductive. Each help in "the development of reliable knowledge" (Gregory &

Muntermann, 2011, p6). Deductive research is conducted based on a hypothesis, whereas inductive is based off of observations of the researcher (Gregory & Muntermann, 2011, p6).

Adaptive capacity has been observed by the researcher, in turn the study will be inductive to gain knowledge to develop theories and/or construct change for entry level practitioners.

Data Collection and Analysis

Given this study is qualitative in nature, the data collected needs to reflect as such. It needs to have an open inquiry and naturalistic in nature to gain a "rich description of the setting and phenomena being studied" (Friedman, 2012, p183). Part of being able to gain that rich description, Friedman states that the data should include both emic (insider) and etic (outsider) perspectives (2012, p183). When selecting data, thought must be given to which source(s) are sufficient to answer the research question (Friedman, 2012, p186).

In order to gain knowledge, a wide, purposive selection of public safety practitioners and educators will be interviewed and recorded utilizing semi structured interviews (Etikan, Musa, & Alkassim, 2016, p1). Selection includes the following positions:

- Fire Chief

- Training Chief of a fire department

- EMS and Fire Science Primary Educators

- Line Officers (Direct Management) of public safety practitioners

- Firefighters and EMS providers

The tentative theory is that utilizing those with various years and different aspects of experience will develop a common theme that can be defined and reach a theoretical saturation. Theoretical saturation "is attained when data after analysis are consistent in quality and

quantitative density" (Nascimento et al, 2018). The method "solicits information from experts who have a wide range of experience, by inquiring about their experiences and opinions researchers significantly extend the empirical observations upon which their initial theory is based—thus strengthening the grounding of the theory and increasing the likelihood that the resulting theory will hold across multiple contexts and settings" (Okoli, & Pawlowski, 2004, p15). The list is not all inclusive as well, the survey will include a follow up question of "is there anyone else I should talk to about the subject?" to create a snowballing affect to achieve a deeper saturation of information. The goal is to obtain at least fifteen interviews to have a sufficient pool of data.

Snowballing allows those who are initially interviewed to give recommendations of others who may have information to add to the research (Etikan, Alkassim, & Abubakar 2016, p3). The initial interviews were selected via known contacts, whom the researcher has built a rapport, and they themselves have been established within their respected positions and have collected various amounts of experience. In addition to, if the snowball effect will come from any known contacts of the participants, that they have made within their careers who could add to depth of the study.

The interview questions and methods were approved through Oklahoma State University's Institution Review Board (IRB) in October 2022 (Approval IRB-22-439) (Appendix C). No interviews were conducted prior to the approval from the IRB. A set of ten, open-ended questions was produced; including the participant's background and experience, their views and experience surrounding adaptability, and recommendations they might have towards the subject. They were formed with a combination from the literature review and the researcher's experience (Roberts, R., 2020, p3189). They were formed to give insight how the participants have experienced and learned adaptability. A pilot interview was conducted with a newly promoted captain within the

researcher's fire department. Consent was obtained and it was recorded to make sure the equipment used work sufficiently.

All participants who consented (Appendix B) to participate will be interviewed with semi structured questions (Appendix A) and recorded with a digital voice recorder. The setting will be agreed upon with both the participant and the researcher. Options will include both an in-person meeting at an agreed location or utilize video conference software (Zoom or Microsoft Teams). The recordings will be digitally stored on a password protected Dropbox file, in addition to the recorder itself will be locked within the researcher's private home in a locked safe. All identifiable information will be deleted to keep participants anonymous. After the interview the recording will be transcribed.

After the interviews and transcription is complete, the files will be uploaded into *Atlas.ti* for content analysis. The process "has been defined as a systematic, replicable technique for compressing many words of text into fewer content categories based on explicit rules of coding" (Stemler, 2000, p1). The goal is to develop inferences from the data (Stemler, 2000, p1). Stemler (2000), that there are six questions that "must be address in every content analysis:"

1) Which data are analyzed?

2) How are they defined?

3) What is the population from which they are drawn?

4) What is the context relative to which the data are analyzed?

5) What are the boundaries of the analysis?

6) What is the target of the inferences?

For content analysis to be successful, coding of the documents is required. Two types of approaches to coding include emergent or priori coding (Stemler, 2000, p2). Emergent coding is categories developed after "preliminary examination of the data;" whereas priori coding are

categories developed prior to analysis based on theory (Stemler, 2000, p2). Emergent coding will be utilized after the initial examination of the data to develop groups and codes.

Reliability and Validity

To have valid results to build theory, the study must have reliability. Reliability is a concern when measuring behavior (Drost, 2011, p106). Reliability is that when the results are the same over time or consistent when the study is reproducible (Golafshani, 2003, p598). To minimize error within the study, the following three questions should be considered regarding reliability:

1. What factors affect the reliability of a test?
    a. Sources of error within a test
    b. Variation between tests
2. How can I make a test more reliable?
3. What is a satisfactory level of reliability? (Drost, 2011, p112-114).

Then validity reflects if the results are truthful, or "does the research instrument allow you to hit 'the bull's eye' of your research object?" (Golafshani, 2003, p599). Researchers should consider both internal and external validity of the study. Internal validity "speaks to the validly of the research itself;" whereas external asks "how generalizable is the relationship across persons, settings, and times" (Drost, 2011, p120) (Johnson, 1997, p2). One threat to validity is researcher bias (Johnson, 1997, p2). Since this study is based off the researcher's personal experience, care was taken to reduce bias so that the result was factual. In addition to working with the university advisor to provide a peer review. Johnson (1997) states there are three types of validity: descriptive, interpretive, and theoretical. Descriptive validity requires the use of triangulation and multiple observers (Johnson, 1997, p4), whereas this study is conducted with a sole researcher. Interpretive validity is focused on the "meaning attached by participants to what is being studied

by the researcher" (Johnson, 1997, p4). Fact checking and validation of what the participants helps with the interpretive validity. The third validity type is theoretical; Johnson (1997, p5) states that this theory explains the phenomenon being studied through facts, and that the explanation developed fits the data; in turn it is credible and defensible. Theory triangulation helps validate the theory (Johnson, 1997, p5). The idea is that the phenomenon is studied with different theories, and in this study the idea of adaptability is not only looked at from practitioners but includes educators and management as well.

CHAPTER IV

FINDINGS

An inductive, thematic review of the transcripts was conducted using *Atlas.ti* software. A "thematic analysis is a search for themes that emerge as being important to the description of the phenomenon" (Fereday & Muir-Cochrane, 2006, p82). The documents were read through three times: first as a passive review, second as a comparison for each question to the answers, and a third to code the data, while following the University of Leicester's content analysis process (n.d). Theoretical saturation (the point where no new insights or ideas are developed [Hennink, Kaiser, & Marconi, 2017, p592]) was reached after sixteen interviews were conducted of various levels of management, fire and EMS practitioners, and educators. Saturation was reached when common answers to questions were coming from the participants. One example is that all of the participants expressed that adaptability in public safety is traditionally learned informally, through trial and error.

Table 4.1 reflects the participant's current title, an organization description for which they currently work and their total years of experience. Leading up to the point of the interview, each of them have held various roles throughout their careers, and all of them have had

practitioner experience at some point. The analysis was conducted to attempt to develop theory to answer the research question while in the contents of the aim and objectives of the study. Their names and organizations are not listed to follow Oklahoma State University's IRB privacy policy. In addition, gender neutral pronouns (*they/them*) are used throughout to add a layer of privacy for the participants.

Table 4.1: List of Participants

Participant ID:	Title	Organization Description	Experience (Years)
1	Flight Paramedic	Private EMS Helicopter Based Transport	20 Years
2	Firefighter/ Paramedic	City Fire Department Urban/Metropolitan Setting	18 Years
3	Firefighter/ Paramedic	Fire Protection District Rural Setting	10 Years
4	Fire Lieutenant	Fire Protection District Suburban/Rural Setting	16 years
5	Fire Chief	City Based Fire Department Suburban Setting	23 Years
6	EMS Primary Educator	Community College EMS Program	29 years
7	EMS Academy Directory	Community College EMS Program	34 years
8	Fire Captain and Training Officer	Fire Protection District Rural Setting	16 years
9	Firefighter/ Paramedic	Fire Protection District Rural Setting	18 Years
10	Fire Lieutenant	Fire Protection District Rural Setting	18 years
11	Engineer (Driver)	Fire Protection District Rural Setting	12 years
12	Educator Fire Science and EMS Instructor	Community College Fire Science and EMS Programs	30 Years
13	Training Chief	Fire Protection District Suburban/Rural Setting	20 Years
14	Firefighter/ EMT	Fire Protection District Rural Setting	10 Years
15	Assistant Fire Chief	Fire Protection District Rural Setting	15 Years
16	Firefighter/ Paramedic	City Fire Department Urban/Metropolitan Setting	11 Years

Content Analysis

While reading through the transcripts each time, the Ten Steps of Content Analysis from University of Leicester (n.d.) was followed to help answer the central research question.

1) Copy and read through the transcript: make brief notes in the margin when interesting or relevant information is found

2) Go through the notes made in the margins & list the different types of information found

3) Read through the list and categorize each item in a way that offers a description of what it is about

4) Identify if the categories can be linked any way and list them as major categories (or themes) and/or minor categories (or themes)

5) Compare and contrast the various major and minor categories

6) If there is more than one transcript, repeat the first five stages again for each transcript

7) When you have done the above with all the transcripts, collect all the categories or themes and examine each in detail and consider if it fits and its relevance

8) Once all the transcript data is categorized into minor and major categories/themes, review in order to ensure that the information is categorized as it should be.

9) Review all the categories and ascertain whether some categories can be merged or if some need to them be sub-categorized

10) Return to the original transcripts and ensure that all the information that needs to be categorized has been so.

Interview Findings

After conducting the interviews, they were transcribed so that they could be uploaded to *Atlas.ti.* A total of sixteen interviews were uploaded and reviewed. Each transcript was reviewed at least three times: the first as a passive review, the second as a comparison between the various interviews, and the third was to code the data. A total of over 37,000 words was reviewed from the interviews. The following themes were discovered through multiple, similar responses throughout the interviews: *definition and views of adaptability, examples of adaptability, how adaptability is commonly acquired in public safety, adaptability training* (including informal versus formal training ideas), *entry level education*, and *recommendations* from the various participants. A total of eighty-eight codes were found (both grouped in the above themes and *In Vivo* coding as well).

Theme 1: Definition and Views of Adaptability

Commonly throughout the interviews, a shared theme of adaptability is being able to develop secondary and tertiary plans in case the initial plan does not work to accomplish the goal of mitigating the situation at hand. *If plan A does not work, what is your plan B and/or plan C?* Mastery and knowledge of the skill are reflected in positive outcomes. The ability to alter course sometimes needs to happen quickly and flawlessly for a successful outcome. Having a common definition is helpful in the sense that if change is to occur within the industry because it provides a common ground for which change can be built. Table 4.2 shows various quotes and points of view from the participants when they were asked *"what does adaptability mean to you?"*

Leadership was asked *"which group of your employees do you feel who can adapt to various situations the best?"* While there were mixed answers from the participants, some said new recruits/probationary members while others said their officer corps. Those who felt that the new employees showed eagerness to learn and went with the flow. That they may have not

recognized at the time that as plans changed, they were in fact being adaptable. They were 'go with the flow' employees who wanted to be a sponge of information. Whereas the leadership is responsible for making decisions that guide their subordinates on responses and during a shift. Developing multiple plans in case something does not work or goes as originally planned is what they have trained for through officer development and/or experience. Hopefully upon their promotion they have had practiced that strategic view of mitigating emergencies so that the damage is hopefully less than originally expected. Participant #5 (the fire chief) states that "when an officer has arrived at the point of being an officer, and within their career they have spent a number of years adjusting to the various challenges…They tend to have more understanding of…the overall global picture of a fire agency and its role within the community".

Table 4.2: Adaptability Definitions

ID	Quote
1	It means that you can't ever stick to one path, one road.
2	You have to have in mind what direction you want to go down, but you need to be able to gather the most amount of information you can in the smallest amount of time to be able to really hone in on what direction you need to go -- which is the right direction? Knowing that that right direction could change at any minute, so you have to be able to have the mental acuity and the flexibility to be able to adapt to a new situation or setting.
8	Adaptability means to me in general, being able to change your beliefs, behaviors, or practices to fit the current situation. It means whether it's like long-term trends or, long-term trends in the world, or immediate changes you're faced with on scene, it means being able to assess them and then be able to change behaviors to best accomplish what you're trying to do but it means being, there's some flexibility in there and there's some open-mindedness needed to accomplish that
12	You have to be able to overcome that and be able to handle the situation and adapt to the situation to still get the job done. If you don't, then potentially worse outcomes could happen.
7	I think adaptability generically means to have the ability to modify, change, alter or sometimes stop current practices to better acclimate and meet the needs of the task at hand, whatever that task at hand may be.

| 4 | Things never go the way they do in training, so just being able to overcome obstacles and move past them efficiently and effectively, doing things in a timely manner, that's a big part of being adaptable in the fire service. |
| 5 | Adaptability means the ability to be flexible to meet different needs and different requirements from a variety of sources. Adaptability means being willing to look at different options in terms of solutions. |

Theme 2: Examples of Adaptability

The participants in the basic sense talked about various times they had to adapt within their careers. The question was asked "*has adaptability played a part in your experience and career? If so, how?"* Various, generic scene related scenarios were given of how multiple ideas were thought of to accomplish the same goal for the given situation. But that adaptability within public safety has long term affects as well including focus of the practitioner or management, tactics, technology, and education. One example given is that a practitioner may arrived at their assigned station but then be changed to a different station and different crew for the day. That their mentality may shift from their normal responses to a more specialized focus for the shift (technical rescue, wildland firefighting, hazardous materials, etc). Educationally, a couple of the instructors noted that not only theories and practices in prehospital medicine have changed constantly, but the needs of their students as well. Participant #6 noted that a new study came out before a lecture they were about to do in a few hours, so they modified their lecture to include the study. In addition to, they noted that the agencies that the students are coming from have requested new training in evolving areas, again having to modify the curriculum to meet the needs of not only the public safety entity but also the community for which they serve. Both educational and public safety entities have seen changes in the wants and desire of the public, that more is required of the fire service beyond putting out fires (technical rescue, hazardous materials, public education). EMS practitioners are providing more than emergency medical care on scenes (i.e. community paramedicine).

Home life is a consideration as well. The two chiefs interviewed are now assigned to a more Monday-Friday work schedule (or a similar variation). Both stating that when they transitioned from shift work and being away a third of the time to being home every night as an adjustment for both them and their families. The COVID 19 pandemic proved to have a lot of changes in the field and educationally. Safety concerns required changes in practices and operations including masks always donned, remote learning then transitioned into barriers between students and training mannequins during class, and some thought that the constant change was possibly part of the decline of applicants coming into the field.

Participant #12 stated that while their career has been spent in Colorado, they had spent personal time in Wisconsin. They stated that to help combat lower numbers in available practitioners, that Wisconsin has developed a statewide mutual aid agreement where resources could be shifted easily if a large-scale incident were to occur. That personnel could move and distribute remaining available resources throughout the area to include occupying the buildings/stations of other jurisdictions.

Theme 3: How Adaptability is Learned and Practiced

The participants all agreed that adaptability was learned informally through experience; both from someone in a more senior position taking them under their wing but also out running real life responses versus crafted scenarios. It was commonly echoed, that from early on firefighters and EMS providers must be able to adapt and overcome when the need arises on calls; in turn created a memory bank of experiences and lessons. On the same token training still needs to occur on a regular basis to provide insight into new methods or developments and refresher into skills and ideas that may have been lost. Participant #8 stated "all of this stuff is like perishable, like all of these skills are perishable, your ability to adapt is perishable." Because reviewing the book is not sufficient, that it was black and white material whereas public safety

responses are typically a gray area with bits and pieces mixed. Those who did give thought were

unsure of how or if adaptability is taught formally versus building it informally into a training

scenario (i.e. *plan A will not work, make the participant(s) develop plan B…plan C…etc.).* Table

4.3 is quotes regarding adaptability training.

There were varying views on when to formally teach adaptability, ranging from initial

academies to after a few years of working and having gained experience. The difficulty of

teaching it during an academy, is that much like the textbook, the focus on the black and white

skill and entry level knowledge development is a must. Participant #13 noted that academies are

structured to learn the basics, and they compared it to teaching their teenage child learning to

drive. First, start in a wide-open parking lot with start, stop, and turning (the basics), then once

comfortable moving to suburban roads, and finally once proficient onto the highways. Stated that

when recruits are learning new skills, they are taught step by step in a linear fashion, whereas on a

response that linear fashion is nonexistent with multiple actions typically happening

simultaneously with multiple practitioners. He cited that the skill must be broken down so the

complexity is understood for when the time comes, and it is needed on a response; the time to

think about it is nonexistent and can happen both quickly and accurately. New recruits are

commonly required to complete a task book throughout their first year of employee that is similar

to the step-by-step skills originally taught to them. They are used within conjunction of vetting

skills learned during their initial training but also making sure the probationary member can

function as a part of their new team. When asked of leadership group, these tasks books do not

make mention of formal adaptability but might have some informal simulations built into them.

The educators noted that they have standards to follow, the ones mentioned in the

literature review. The EMS Academy Director (Participant #7) noted that for accreditation of the

program they need to be able to show proficiency via passed national exams, documented skills

performed during class and clinicals, and the students had a predetermined amount of patient

contacts/assessments. They stated that there is nothing in curriculum formally taught on

adaptability, but that informally it may be built into simulations. They stated they do have some

leeway in what is taught as long as the above outcomes are achieved. They also noted that for

their program they go beyond the minimum requirements but still teaches following the textbook

since that is what the students will be tested against, but that other programs may not function the

same for one reason or another. Participant #12 echoed similar that they are bound by the

curriculum developed by the college, but when they are teaching skills to EMS students, they will

ask their students "what is plan B if plan A doesn't work?" to start that building of knowledge.

Table 4.3: Adaptability Training Views

ID	Quote
11	There's no classroom setting where they sit down, and they spend time with adaptation when an event arises. It's just kind of built into the training. Instead of saying, "Hey, you need to adapt here," it's really their best decision based on the situation they're given. The more trainings you go to, the more ability I believe you get to that. But it's something that takes time and education.
1	I think it's the first two years of being in the fire service or in the EMS industry where you really learn to take that knowledge and learn adaptability in informal ways by training with your crew, by running the calls, and getting the repetitions and seeing all of the ways that an incident can change directions.
14	There's not really a lot of ways that you can teach that adaptability in books. I think there's a lot to be said about training, so hands-on training, so whether it's live burns in structures, whether it's scenarios in the medical realm that are hands on that, you know, you have feedback from another participant instead of just words in a book. I think those help in the formal setting teach that informal adaptability that you have to get used to.
12	Oh, I fully think it should be taught there...I think it should be definitely reiterated in both from the get-go and reiterated throughout all training no matter how high a firefighter goes or EMT goes whether they go all the way up to doctor.

Theme 4: Entry Level Education Review

As stated, the entry level education is a black and white world full of rapid knowledge

gain over a short time period. It is a double-edged sword in that practitioners gain an immense

amount of knowledge, but do not necessarily learn how to efficiently connect all the pieces of the puzzle. This in conjunction with all whiles stressed with making sure that they can pass the tests at the end. To add pressure to the situation, safety is an undisputable requirement that must be adhered to at all times. The question was asked: *Do the - fire or EMS - academies equip entry level providers with the knowledge and skills to be proficient and safe whilst ensuring they can adapt to the demands of the job? With the follow up of why (if they agreed) or what could be changed to improve the outcome.*

Commonly it was stated that students and recruits learn the knowledge to be successful; they learn the skills to pass the practical at the end of the course, but they do not learn how to apply it globally yet without experience. An example was given that safety is stressed from day one, that EMS students could be heard chanting "BSI, Scene Safe," but then place them on a scene where a weapon is on the table, they may not have realized it was there until a dangerous situation exists. Entry level firefighters are typically taught using a concrete building with propane fueled props so that multiple repetitions can occur amongst the recruits. While the skill of moving hose through the building and applying the water is accomplished; the awareness of the dangers is minimized (i.e. the decaying building (from actual fire), decreased visibility due to smoke, house hold objects (tables, couches, beds, etc) that block paths, and/or the heat normal felt is severely decreased as a result of using the training building).

Another theme that developed was the difference of that of a fire academy that was departmental based versus community college based. While the students who attended a community college program knew and understood the basics, they did not get as detailed academy as that of a department-based academy. Leadership and practitioners felt that both still had the knowledge, but those who attended an outside program sometimes had to a steeper learning curve when applying and learning institutional knowledge versus those who went through a department-based academy.

Discussion

Adaptability is experienced in everyday life by not only public safety practitioners, but anyone who must make a choice. From the first day walking into academy to the last day of retirement, practitioners face choices to make. What comes into play are the *'what if'* type situations, where various outcomes can occur depending on what factors are presented. Not only do practitioners have to adapt to various responses, other aspects of their career will require them to adapt as well; from moving stations, changes in best practices (operationally and administratively), and personal life. Education is key to success, but both formal and informal educators need to be able to adapt to their students so that the message is received. They need to stay current and flexible on best practices and current research in their respective fields as change can be viewed as a constant.

History shows that emergency service practitioners gain this knowledge through experience, but if trends continue change needs to occur so that those who choose to enter the field can be as successful as their predecessors.

CHAPTER V

DISCUSSION AND CONCLUSION

Participant #3 noted that they could be most senior person for the day, acting as the

officer on the fire engine. The rest of their crew, their responsibility, have a collective five years

of experience together amongst the three of them. This in itself can be dangerous given the right

situation. While they have a lot of experience overall, they have been put into a new role with

others who are in new roles as well. This story is becoming all too familiar across the nation.

Public safety practitioners face a myriad of challenges every day that they show up for a

shift. That list is continuing to grow as the public excepts more of their public servants, but on the

same token there is an overall decrease of those who want to answer the call. The attacks of

September 11th drove millions to not only join the military but also the various aspects of public

safety. The Colorado FIREfighter Testing Consortium in their last testing process only saw sixty-

one applicants, whereas previously there used to be hundreds if not thousands who were wanting

a chance at becoming a firefighter (Participant #5) (Shoffner, 2021).

Those applying have various backgrounds and histories, some public safety or military

based and some that have no idea what they are about to get themselves into. Regardless of

backgrounds they face the challenge of having to adapt. In addition to adapting on responses, they will need to adapt to their new career, department, crew, apparatus, equipment, the citizens for which they now serve, changes in family/home life, etc. Everyone at some point must adapt to their surroundings at some point, but the decision on average does not involve a building on fire or someone's life in the balance.

As stated before, practitioners when they first come onto the job typically are paired with a mentor who both guides and keeps an eye on them to make them successful. They pass along the institutional knowledge they have gained to make the recruit successful, in turn when the need to adapt presents itself the practitioner will be better equipped. But given the last three years of the COVID-19 pandemic, the fire service and EMS industry have been subjected to 'The Great Resignation' much like every other industry (Shoffner, 2021). Therefore, the industry is losing individuals all with various levels of experience.

The study's aim was to *"define a process to decrease a gap in institutional knowledge and increase adaptative capacity for new recruits of public safety organizations."* Throughout the study a common theme appeared that adaptive capacity is learned through experience. That ability to change course depending on the factors that are present given the situation. That institutional knowledge that is gained via running on actual responses or teachings of someone who has ran that call before so they can pass along the advice "*hey, try _____ instead next time.*" In addition, that knowledge of not only response knowledge, but other aspects of the profession (training, administrative tasks, etc.)

Recommendations for Practice, Policy, and Theory

Practice and Policy Recommendations

The following are recommendations based off this current study. These are limited in nature due to constraints of the study (discussed below) and should be expanded upon so that if

the trend continues and public safety organizations and educational programs see a decrease in applicants so that institutional knowledge will not be lost.

Public Safety Organizations Recommendations:

1. An intensive, thorough initial and continual training program

   a. Have formal training on adaptability

2. A series of well-rounded, thorough task books

3. A variety of recruitment practices and increased effort to maintain retention

4. Culture Development

Public Safety Organizations Practice Theory

1. Formal Process of Evaluation and Change

Entry Level Education Recommendations:

1. Increased simulation-based training

   a. Incorporate lessons on adaptability

2. Flexibility in Teaching

3. A variety of recruitment practices

Public Safety Organizations Recommendations

1) Training Program

While the initial training needs to have the basics to begin, as students develop and show mastery of the basics training needs to intensify to include a variety of changes. Challenge the recruits to adapt and develop a new plan together as a unit while still in the safety confines of a simulation. While the process is informal to begin with, it starts the process of being able to develop multiple plans for the same situation. With information overload, those new to the industry may not realize what is happening in front of them is key to the changes they need to

make. Training not only needs to include situations requiring adaptability but situational

awareness as well. The problem in lies that an employee day 1 out of academy could be facing a

major incident. While training cannot encompass every little detail, it needs to be robust enough

that the officer has some faith within their new employee to be able to function efficiently.

Evaluations should not only include skills, but also more abstract scenario evaluations as well.

A well-developed continual training program will help skills and knowledge be refreshed,

especially key for departments (or stations) that do not have as many responses compared to units

placed in a busy urban setting. It incorporates baseline skills into the large picture of a response.

As probationary members develop their skills and entry level knowledge, have a formal training

on adaptability to include how to increase adaptive capacity (both through experience and

physiologically).

Table 5.1: Training Program Recommendations

ID	Quote
6	You can't just expect to take somebody straight out of a school somewhere and throw them into that environment and expect them to do well.
1	Incorporating stress inoculation, more realistic scenarios. It takes more time and more resources and more work and more effort and more money realistically…While you're doing extrication, incorporate some EMS training into that. It doesn't have to just be able extrication training, right. You can have a HazMat component to it by putting down some, you know, some fake whatever that you want to spill out. And there's a patient there but incorporating more disciplines into it.
3	I think the job's just too complicated to get that out of an academy or like initial training. That's why we're always training. But independently in certain situations, yeah. But I think that adaptability has just got to be kind of constantly refreshed.
5	I think that being a smaller agency and having limited resources it would also be nice to have more formalized processes for evaluating individuals and how their knowledge retention is occurring. We do have some within our current system, but it would be nice to spend, you know, additional time with each new recruit and be able to kind of make sure that they are adjusting properly.

11	I think teaching situational awareness right off the bat is important. You know, we are in a very dynamic trade where things can change at a moment's notice. And there's usually signs that things are going to change and if you're not paying attention to it, then your ability to effectively adapt and make changes drastically lowers. So, really spending the time with recruits to let them understand like how quickly something can change or thinking outside the box when things change, I think would help prepare them to adapt for the changes not only in the critical situations but in life, long-term changes, too, as departments change, and the fire service changes.

2) Tasks Books

Some of the participants organizations have task books that are to be completed within a recruit's first year of employment as part of their field training. The National Wildfire Coordinating Group (NWCG) has a task book for most every position within the realm of wildland firefighting. Taking this same idea and translating into the other aspects of public safety for every level (from recruit through chief officer), will help with not only skill development but also make sure that the same institutional knowledge is passed along in case someone is unable to hand it down traditionally. "The position task provides an observable, measurable and standardized means to evaluate and document trainee proficiency" (NWCG). The quote in Table 5.2 is from Participant #4 talking about their organization's task books. They expressed that they felt it help put everyone on the same page from both the bottom and the top of the department.

Table 5.2: Task Books

ID	Quote
4	There's a lot of muscle memory stuff in there. And most of the signoffs are not a one and done type of thing. We're going to go over the topic as a crew. We're going to do it. We're going to teach it to you. We're going to show our way. You're going to show us the way that they showed you in academy. And then a week later we'll probably have you come back, and we'll have you teach it to the crew just to see if we -- we have that retention and muscle memory.
15	Probably additional task books for a few certain things. Like we have a general driving task book for like a pickup and then an engine but split it out. And then short -- if it's specific the way we're -- what I was just talking about -- I would probably have like shift trainings would be kind of dialed out a little bit more in conjunction with those task books. Like right now it's kind of just whatever they want to do. Which works but it can extend the task book out a little longer.

3) Recruitment and Retention Practices

Traditionally the idea of being a firefighter attracts hundreds (if not thousands) of applicants on its own. With the decline in applicants, organizations need to become creative in how they get their message out, but still need to selective in who they hire. While some departments have started creating flashy social media videos; not everyone has the time, money, or staffing to accomplish such a task. Participant #13 stated that recently their department went and handed out cards with QR codes so that applications could be filled out from the user's phone or tablet; that traditional paper applications are a thing of the past. Consideration of utilizing target-based advertising could possibly help bring in more applicants. Evaluations of adaptability should be performed during the hiring process as well. Those who are rigid in their thinking will not thrive and ultimately fail with a career in public safety. Taught to me early on that *change is the only constant in the fire service*, therefore applicants should accept change as it is inevitable.

Efforts need to be made to increase retention, which is difficult in these times of being short staffed and overworked. Providing different modalities of healthy stress relief and mental health tools should be part of that program. Public safety practitioners having had an increase in their struggles with mental health. In 2021, suicide for firefighters and EMS practitioners was 18 per 100,000, compared to 13/100,000 of the public (Moore-Merrell, 2021).

Table 5.3: Recruitment and Retention

ID	Quote
1	I think we do that as best we can as an industry once people are going through FI, but you also have to take into consideration with everybody being so understaffed and overworked and fatigued, that fatigue comes with training, it comes -- there -- it affects how you perform on trainings. It affects your patient care sometimes with compassion fatigue. Like we are all really fatigued right now as an industry with hurricanes and fires and snap colds and floods and Covid and drug epidemic, narcotic overdoses, whatever it is. But we're all tired, so asking somebody to go in and put in extra effort, extra time to help people when their patience is really frayed is -- that's a big ask. So, it needs to be something that is, you know, incorporated into the culture.

5	My opinion would be that most firefighters learn adaptability informally. And just as I referenced previously, everything from showing up and not necessarily knowing what it is that you're going to be doing for a particular day based on, you know, the time of the year, based on the emergency calls that occur, and based on the overall staffing and capabilities of the crew or the individuals that you are working with.
6	Employers have to recognize the fact that occasionally somebody is going to come through that and shouldn't be doing the job and it's going to be up to them to identify it through their field training processes…You have to have a certain mindset when you come into the job, you have to kind of, well if you're going to thrive in these professions, you have to be flexible and adaptable to whatever the situation is for you.

4) Culture Development

Having a culture that incorporates the above will help have a successful and healthy department. The more repetitions and training someone can get in, the better they will be when the skill is needed at 3a.m. with little to no sleep and responding on a major incident. In addition to, the culture needs to be change positive. A common saying is that 100 years of tradition [is] unimpeded by progress. Change can create uneasy feelings, but if it is expected then it provides an ease for when it does happen. Humans can be creatures of habit, especially as we age. The most senior members need to not only suggest change but encourage it from the younger members of the organization.

Table 5.4: Culture

ID	Quote
1	[The] culture has by-in, full by-in. Can't be two people out of 50 that are motivated, and the other ones really don't care about going the extra mile
13	The longer you're in the fire service, right, the longer you're like, "No, we're going to do it the same way we've been doing it. We're taking in the old, you know, inch and three-quarter dial-a-disaster fog, that's what we're going to use and -- because it's worked every time."

5   We're unwilling to do that, so, yeah, I think there's, I think it's a fascinating topic and I think on multiple levels, EMS and Fire has to learn how to adapt to their communities, their community's needs and so yes, some type of a formal how to be adaptable and I think kind of personally, that's coming, well when I first started teaching, I was working with Cliff and Gregg and he was very regimented and it was this way and there was no variation and this is how we're going to do it and you're going to jump this far or you are out and it was just very regimented and as I kind of grow on this, it's like, yeah, we can make that work.

Public Safety Theory

1) Formal Process of Evaluation and Change

Current practices are dynamic in public safety. Practices could include how a firefighter accomplishes a task, how an organization conducts operations, or new research in medicine. Having a formal method for anyone of an organization to submit for review of current practices can help drive change as well. A person or committee would be charged with reviewing the current practice and then conducting research to see if the change is a positive one and would provide for an improved outcome.

If the change is warranted, then the change should occur. To accomplish and be successful in a dynamic environment, organizations need to build out mechanisms for which formal change can occur. It will give a path so that everyone is on the same page and the information is reviewed by everyone within the organization. Much like the corporate world, public safety entities must adapt to the current world. The "way of doing business is changing drastically due to globalization, privatization, and liberal government policies etc.. To survive in this highly dynamic and competitive environment it is of great importance for all to know what is change, [and] how to manage it" (Burke, 2002). While Burke's book is about private workplaces, the theory still applies to public safety as well. Public safety attracts a wide array of backgrounds, experience, and lifestyles. Since change is going to happen regardless, consideration of

everyone's opinion when implanting change with a formal process will help create a streamlined, constant process for everyone.

Entry Level Education

Education is key to success for all aspects of life. It is the basis for change and build upon what is already know. Entry level education into public safety is a must so that the foundation may be set for which the house can be built. Much like trends and practices can (and will) change, the textbooks will as well, which means that instructors need to be just as adaptable as well.

1) Simulation Based Training

While some programs exceed the number of hours required for patient contacts and clinical time, not every one of them do. It could be due to a variety of reasons (i.e. access, time, money, etc.). Building a solid simulation environment will help create a more realistic response to start to connect all the dots of the lessons that have previously been taught. Building in days to the schedule where students can run simulations will help solidify skills and knowledge that has been gained throughout the course. As the students become versed and showing proficiency, add challenges and changes to the scenario. Consider a poor outcome for the situation, even if acted correctly since it is a reality of the field. Instructors and training cadres need to remain vigilant of not only current practices, but what the future holds as well. Participant #6 stated that there are technologies coming being developed for future use in the classroom including virtual reality. If instructors are not comfortable with the technology, it can become a hinderance or create a poor learning environment.

Table 5.5: Simulation

ID	Quote
6	I think there are some really interesting technologies coming down the pike, regarding teaching clinical skills, approaching patients, interviews, AR/VR, Augmented reality, virtual reality, online exercises, there's a whole bunch of ways, because historically we've always been so focused on here's a mannequin, here's a simulator, the higher quality simulators is what we need to get the most realism out of a scene, but some of this new stuff coming around, it's finally starting to gain some maturity and some flexibility, and I think in the next 5 – 10 years, it's going to become to a point where students are really comfortable with the VR environment.

2) Flexibility in Teaching

Not only do practitioners need to be adaptable, instructors of the field do as well. Much like any work environment, there are daily operations that can be affected by various outside influences that end up having a causal effect on the class itself (weather, sickness (or pandemic), classroom issues, etc.) They need to be flexible but also adapt to the situation in front of them. Adult learners come in all shapes, sizes, and from a variety of back grounds; this includes how they learn as well. The three primary ways of learning are visual, auditory, and kinesthetic (Missouri State University). Instructors need to have built into their lesson plans how to cover the topic for each of the learning styles so that all the students can learn and understand the topic. Participant #6 stated that as an instructor if a student becomes "vapor locked" where he/she cannot move past a certain point the instructor needs to consider what to do or say that will help the learning continue. Much like in public safety, flexibility means changing what and how a topic is covered if the material is outdated.

Table 5.6: Education Flexibility.

ID	Quote
6	Like how do you, through practice, through good debrief, through good discussion, you impose, you impart on the student like the importance of being flexible and keeping an open mind to the situation before you…We're going to put them in ACLS scenarios and they're going to be locked in and then all of a sudden, you're going to be, like what about this? Look at this? Do you think that fits? They're going to have this blank look on their faces because they're going to be like, oh, I didn't think about that.

7	Sometimes what you have to do is you have to stop and figure out what do we have to stop doing? What should we stop doing so we can actually be progressive and move forward and I don't think EMS is good at that. I don't think we're good at saying, we're going to stop teaching this so we can teach this. I don't think we're good at saying we're going to stop providing this service so we can provide this service. I don't think we're good at that. I think like intubation, is a great thing. There is no evidence that says, paramedics should be intubating, and in fact a lot of the evidence says that paramedics can kill people when they intubate.

3) Recruitment

Similar to public safety entities, educational programs need to have recruitment programs to give both awareness but also help inspire those who never considered a career within the field. Consider using various means of attention including digital platforms where more of the masses could be reached quickly. Also, traditional methods of job fairs and outreach to local high schools is a consideration as well. While this may not seem important to some, or have the resources, educational programs need to consider that a constant stream of students equates to a living program. Low enrollment could possibly shut down a program.

Limitations of the Study

"A limitation of a study design or instrument is the systematic bias that the researcher did not or could not control and which could inappropriately affect the results" (Price & Murnan, 2004). This study was limited by constraints of the study design, time available to the researcher, and available resources. If more time was available, further consideration would be given to more of an evaluation and effectiveness of the recommendations provided. In addition to, most of the participants recommended additional individuals to speak with about the topic as part of the snowball method for data and theoretical saturation. Given the time constraints of the school's graduate college calendar and that could not be completed, one individual included a recommendation for an individual with forty plus years of experience and worked for one of the largest fire departments in the country and then transitioned into the rural setting after he retired.

Another constraint was accessing individuals for whom were not my employees/subordinates. Time between IRB submission, conducting the interviews, and having them transcribed left little time for additional required training. Therefore, while I was near those who has had practitioner experience forty-eight hours a week, they could not be utilized.

Future Research

Beyond having more time and available resources, Participant #2 stated that consideration should be given to groups like women, minorities, and those with varying political and spiritual beliefs. They work in a very conservative, Christian faith-based area, and their belief is that those groups may have had to face additional challenges (adapt) to be able to function successful within the department. They noted himself that they do not fit that mold and has had some challenges because of it.

Participant #16 stated they would recommend looking at the mental health aspect of adaptability. Compare and contrast considerations like lifestyle (diet, exercise, sleep, etc) and mental fortitude and strength of the individuals who can adapt easily and efficiently versus those who cannot.

Additional consideration would be comparing departments who have implemented some of these changes (i.e task books) to those who do not have one or are more generic versus detail oriented. As well as an in-depth study of time and costs spent on training of departments who have high turnover, as well as a long-term study comparing institutional knowledge that is lost, gained, and/or is modified. Heightman (2017) states that "very few metrics or measures exist to quantify the loss-or value-of institutional knowledge, continuity, and history. The loss typically is manifested as turnover, recruitment, replacement, and training costs that many organizations face." Consideration could be given to developing metrics to measure loss and measure what is successful.

Conclusion and Reflections

Public safety entitles are facing a crisis, there are more calls for service and less people to answer the call. Houston Fire has struggled to have available ambulances 84% of the time this year (Oberg & Rafique, 2022). The story came about because a male party went into cardiac arrest and the first arriving ambulance took eighteen minutes to arrive on scene. The industry is losing adaptive capacity that is gained by passing down lessons from senior members to new recruits. Building up solid recruitment and training programs will in turn help build up both staffing and institutional knowledge so that everyone is trained the same way. Creating a culture of positive training and acceptance of change can be difficult but, in the end, prove beneficial. Thinking outside of the box for recruitment is a must. Traditional methods are proving to be down since the flair of being a firefighter or EMS provider is not what it used to be.

This study came about as a discussion with my thesis advisor, noting that I had generally taken an approach of mitigation themed works throughout my studies. This in turn was similar in that given the above recommendations, the disaster that awaits if nothing is changed is going to be worst in the long run. Much like discussed here, this study faced a lot of changes and required adaptations of myself and the study. The skill is second nature for most, but some struggle with change for various reasons. I have personally seen the world of firefighting and EMS change over the last sixteen years of my career, and I expect as much to continue to happen. I have found great satisfaction in teaching the next generations of practitioners (both educationally and new recruits that come through my fire department). My drive is to pass along the institutional knowledge I have gained through the years so that they have successful careers. As I continue with both my physical and academic careers, my goal continues to be the same: helping others through action and sharing of knowledge

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APPENDICES

APPENDIX A: INTERVIEW QUESTIONS

1. What is your experience, education, and background in public safety?

2. What does adaptability mean to you?

3. Has adaptability played a part in your experience and career, if so, how?

4. Do firefighters and EMS providers learn adaptability either formally or informally, if so, describe how?

5. Do the - fire or EMS - academies equip entry level providers with the knowledge and skills to be proficient and safe whilst ensuring they can adapt to the demands of the job?
    a. Follow ups:
        i. Yes: why do you agree?
        ii. No: What, in your opinion, can be changed to improve the education?

6. Background Specific Questions:
    a. **Public Service Leadership:** After a new employee's initial academy does your department (or agency) have some sort of additional requirements for new employees (e.g. additional training, field internship, apprenticeship, etc.) before they can function independently?
        i. Yes: What is the theory behind the program?
            1. Follow up: during this training is there anything taught on adaptability?
        ii. No: What is the theory behind not having a program?

b. **Educators:** In your opinion, if a public safety entity has an internship/field instruction type program required after getting out of school, do you believe it is necessary?
    i. Why or why not?
c. **Practitioners:** Please describe your ability to adapt to various situations on the job?
    i. Where did you learn the skills?
    ii. If poor: What do you think could help improve your ability to adapt?

7. Background Specific Questions:
   a. **Public Service Leaders:** What changes, if any, would you make to your initial training program?
   b. **Educators:** How sufficient are the curriculum standards set for the curriculum you teach?
       i. What, if any, changes would you make?
   c. **Practitioners:** How effective in preparing you for the field was your initial new-hire training?
       i. What, if any, changes would you make?

8. Background Specific Questions:
   a. **Public Service Leaders:** Which group of your employees do you feel who can adapt to various situations the best?
   b. **Educators:** Do you think adaptability should or should not be taught within the primary education?
       i. Why or why not?
   c. **Practitioners:** Do you feel like formal training of adaptability should be taught sooner or later within your career? Or not at all?

9. Is there anything else you would like to add?

10. Is there anyone else that you recommend that I should speak with?

APPENDIX B: CONSENT FORM

College of Engineering, Architecture, and Technology

Division of Engineering and Technology

CONSENT FORM
Fire & Emergency Medical Services' Adaptive Capacity: A Content Analysis of Training & Education Provision in Colorado

Background Information
You are invited to be in a research study of first responder adaptability. We ask that you read this form and ask any questions you may have before agreeing to be in the study. Your participation in this research is voluntary. There is no penalty for refusal to participate, and you are free to withdraw your consent and participation in this project at any time. You can skip any questions that make you uncomfortable and can stop the interview/survey at any time. Your decision whether or not to participate in this study will not affect your employment.

This study is being conducted by: Lance Schneider, Division of Engineering and Technology, under the direction of Tony McAleavy, PhD; Division on Engineering and Technology.

Procedures

If you agree to be in this study, we would ask you to do the following things:

- Conduct a recorded interview (either face to face or via virtual platform).

Participation in the study involves the following time commitment: Approximately 30 minutes.

What Steps Are Being Taken to Reduce Risk of Coronavirus Infection?
The following steps are being taken to address the risk of coronavirus infection:

Screening: Researchers and participants who show potential symptoms of COVID-19 (fever, cough, shortness of breath, etc.) will NOT participate in this study at this time.

Physical distancing: Whenever possible, we will maintain at least 6 feet of distance between persons while conducting the study.

Mask/Covering: If requested, researchers and participants will shield their mouth and nose with a cloth face cover or mask during the study, even when maintaining at least 6 feet of distance. Tissues will be available to cover coughs and sneezes.

Handwashing: Researchers and participants will wash hands before/during the interview or use a hand sanitizer containing at least 60% alcohol.

Disinfecting materials: When feasible, researchers will clean and disinfect surfaces between participants, using an EPA-registered disinfectant or a bleach solution (5 tablespoons of regular bleach per gallon of water) for hard materials and by laundering soft materials. Disinfected materials will be handled using gloves, paper towel, plastic wrap, or storage bags to reduce the chance of re-contamination of materials.

Electronics: Alcohol-based wipes or sprays containing at least 70% alcohol will be used to disinfect shared touch screens, mice, keyboards, etc. Surfaces will be dried to avoid pooling of liquids

<u>Compensation</u>

You will receive no payment for participating in this study.

<u>Confidentiality</u>

The information that you give in the study will be handled confidentially. Your information will be assigned a code number/pseudonym. The list connecting your name to this code will be kept in a locked file. When the study is completed and the data have been analyzed, this list will be destroyed. Your name will not be used in any report

We will collect your information through audio recording. This information will be stored on a secured, password protected folder on Dropbox.com. When the study is completed and the data have been analyzed, the code list linking names to study numbers will be destroyed. This is expected to occur no later than December 01, 2022. The audio/video recording will be transcribed. The recording will be deleted after the transcription is complete and verified. This process should take approximately three months.

<u>Contacts and Questions</u>

The Institutional Review Board (IRB) for the protection of human research participants at Oklahoma State University has reviewed and approved this study. If you have questions about the research study itself, please contact the Principal Investigator at (303) 748-5497, lance.schneider@okstate.edu. If you have questions about your rights as a research volunteer or would simply like to speak with someone other than the research team about concerns regarding this study, please contact the IRB at (405) 744-3377 or irb@okstate.edu. All reports or correspondence will be kept confidential.

<u>Statement of Consent</u>

I have read the above information. I have had the opportunity to ask questions and have my questions answered. I consent to participate in the study.

Indicate Yes or No:
I give consent to be audiotaped during this study.
      ___Yes ___No

I give consent to be videotaped during this study:
      ___Yes ___No

I give consent for my identity to be revealed in written materials resulting from this study:
      ___Yes ___No

I give consent for my data to be used in future research studies:
      ___Yes ___No

I give consent to be contacted for follow-up in this study or future similar studies:
      ___Yes ___No

Signature: _____ Date: _____

Signature of Investigator: _____ Date: _____

APPENDIX C: IRB APPROVAL LETTER

Oklahoma State University Institutional Review Board

Date: 10/21/2022

Application Number: IRB-22-439

Proposal Title: Fire & Emergency Medical Services' Adaptive Capacity: A Content Analysis of Training & Education Provision in Colorado

Principal Investigator: Lance Schneider

Co-Investigator(s):

Faculty Adviser: Tony McAleavy

Project Coordinator:

Research Assistant(s):

Processed as: Exempt

Exempt Category:

Status Recommended by Reviewer(s): Approved

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in 45CFR46.

This study meets criteria in the Revised Common Rule, as well as, one or more of the circumstances for which <u>continuing review is not required.</u> As Principal Investigator of this research, you will be required to submit a status report to the IRB triennially.

The final versions of any recruitment, consent and assent documents bearing the IRB approval stamp are available for download from IRBManager. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be approved by the IRB. Protocol modifications requiring approval may include changes to the title, PI, adviser, other research personnel, funding status or sponsor, subject population composition or size, recruitment, inclusion/exclusion criteria, research site, research procedures and consent/assent process or forms.
2. Submit a request for continuation if the study extends beyond the approval period. This continuation must receive IRB review and approval before the research can continue.
3. Report any unanticipated and/or adverse events to the IRB Office promptly.
4. Notify the IRB office when your research project is complete or when you are no longer affiliated with Oklahoma State University.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact the IRB Office at 405-744-3377 or irb@okstate.edu.

Sincerely,

Oklahoma State University IRB

VITA

LANCE BRADLEY SCHNEIDER

Candidate for the Degree of

Master of Science

Thesis: FIRE AND EMERGENCY MEDICAL SERVICES ADAPTIVE CAPACITY: A CONTENT ANALYSIS OF TRAINING AND EDUCATION PROVISION IN COLORADO

Major Field: FIRE AND EMERGENCY MANAGEMENT ADMINSTRATION

Biographical:

Education:

Completed the requirements for the Master of Science in Fire and Emergency Management Administration at Oklahoma State University, Stillwater, Oklahoma in December 2022.

Completed the requirements for the Bachelor of Science in Public Safety and Emergency Management at Grand Canyon University, Phoenix, Arizona in 2017.

Completed the requirements for the Associates of Applied of Science in Paramedicine at Arapahoe Community College, Littleton, Colorado in 2010.

Experience:
16 years as a firefighter/paramedic (last three as a company officer), 14 years as an EMS and Firefighter instructor

Professional Memberships:

International Association of Firefighters
International Association of Fire Chiefs
International Association of Arson Investigators