PERCEPTUAL LEARNING STYLES OF

FIRE SERVICE PERSONNEL

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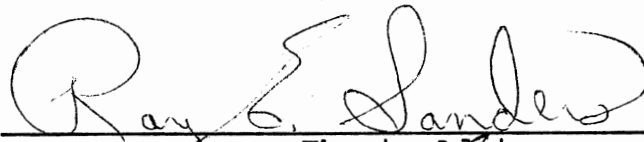
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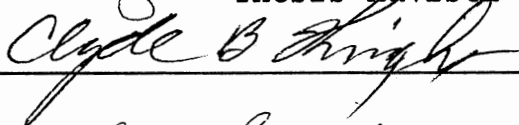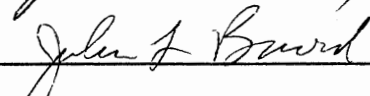
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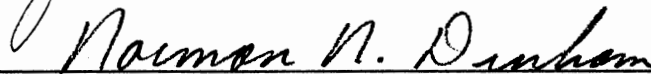
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CHAPTER I

INTRODUCTION

Fire Protection Publications is an extension service
of the College of Engineering, Architecture, and Tech-
nology at Oklahoma State University.   Fire Protection
Publications (FPP) is the headquarters of the Interna-
tional Fire Service Training Association (IFSTA) and was
founded in 1934 in an effort to develop a widespread,
organized program for the training of firefighters.   There
were four states represented at the first meeting, and 53
years later all 50 states and Canada are represented at
the annual validation conference held in Stillwater, Okla-
homa.   During the past 53 years Fire Protection Publica-
tions has enjoyed tremendous growth in sales volume and
product availability.

Relying largely on competency based skills, members
of the fire service have utilized a variety of training
styles.   It has been the traditional approach to use
hands-on training, augmented with classroom instruction.

Firefighters, being an exclusively adult population,
tend to follow learning patterns of adult populations.
Methods of learning reported by adult learners include
listening, observing, reading, practicing, and discussing

(Lucas, 1985). Cherry (1981) concluded that adults' learning style patterns were similar in many ways to childrens' learning patterns as evaluated by Gilley (1975). Cherry (1981) further recommended that learning styles be further studied using additional populations of learners.

Firefighters, representing a large adult population of learners, rely largely on competency based skills. Based on what types of training mediums this particular audience has used for training, and their changes that appear to be taking place, a study of learning styles for members of the fire service was needed.

Fire Protection Publications has experienced a trend of large volumes of visuals being purchased as opposed to printed materials. Management at Fire Protection Publications wanted to be able to predict the future and present training needs of firefighters based on their perceived preferred learning styles.

This information would assist in establishing guidelines for presentation and format of printed materials, visuals, and videotape production. A decision can be made about the product mix in their present line of training aids and materials, and future changes that may need to be implemented for future training needs.

Statement of the Problem

Lucas (1985) found definite learning preferences among prime-year adults (aged 40 to 60) and recommended further research on other adult populations for comparative research. Further recommendations were given to utilize the findings from his study in designing curriculum for adult learners,

> ...so as to utilize those learning styles found to be dominant and/or relatively preferred, i.e., the visual, interactive, and haptic styles (p. 83).

Based on the information obtained by this study of fire service personnel, FPP hopes to be able to project which types of training materials to develop to better match the perceived preferred learning styles of fire service personnel. At this time there is a lack of knowledge of how fire service personnel prefer to learn. This is extremely important to all levels of learners in the fire service from new recruits, seasoned firefighters, and top management personnel.

Purpose of the Study

The purpose of this study was to measure the preferred perceptual learning styles of members of the fire service using James and Galbraith (1984) Perceptual Learning Style Inventory for evaluation of learning styles. This study was based on Cherry's (1981) and

Lucas' (1985) recommendation that their study of learning styles be extended to additional populations of learners.

The research question which was investigated was:

1.   What are the perceptual learning styles of fire service personnel?

Basic Assumptions

The following assumption was made in this study:

1. Responses to the PLSI reflected each subject's subjective opinion about his or her own perceptual modality learning style.

Limitations

This study was limited to:

1.   The perceptual/physiological learning styles of fire service personnel.

2.   Fire service personnel who have purchased materials or requested to be placed on the mailing list to receive advertisements.

3.   One hundred and fifty responses out of six hundred questionnaires mailed. This represented a 27% return rate of fire service personnel randomly selected from across the United States.

Definition of Terms

The following terms were used in this study:

Adult - In the context of this study, due to liabil-

ity limitations, only persons 18 and over are allowed to be employed as paid firefighters. This premise was used when using the term adult throughout this study.

Aural - Gathering information primarily through listening (Kolb, 1976).

Haptic - Gathering information primarily through touching or holding (Kolb, 1976).

Interactive - Gathering information primarily through discussion and talking with others (Kolb, 1976).

Kinesthetic - Gathering information primarily through performance or engaging in bodily movements (Kolb, 1976).

Learner - A person engaged in or expressing an interest in the acquisition of new skills or knowledge.

Learning Style - Individual method of relating to or interacting with the environment for the purpose of learning.

Olfactory - Gathering information primarily through the sense of smell (Kolb, 1976).

Perceptual Learning Style Inventory - Designed by James and Galbraith (1984), to be specifically used for self-perception of learning styles. The questionnaire contains 28 strategies/techniques through which learning is achieved.

Perceptual Modality of Learning Style - The approach that an individual uses in gathering information and knowledge from his or her environment, using the five senses. In this study, the seven perceptual style

elements identified by French (1975) and Gilley (1975) and researched by Cherry (1981) and Lucas (1965) were the basis for investigating the learning styles of adult learners. The seven perceptual style elements are print, aural, interactive, visual, haptic, kinesthetic, and olfactory.

Print - Gathering information primarily through printed word (Kolb, 1976).

Visual - Gathering information primarily through viewing pictures, images, objects, and activities (Kolb, 1976).

Organization of Study

Chapter I defines the purpose of the study. The research questions to be addressed are identified, the basic assumptions in the study are specified, limitations of the study are identified, and the terms used in the study are defined.

Chapter II describes the literature germane to the study. The historical background of the topic, previous studies of learning styles, and literature on the attributes of adults as learners are discussed.

Chapter III describes the methodology of the study. The subjects are identified, the study instruments are discussed, and the data collection procedure is described.

Chapter IV presents the results of the data analysis. The demographic characteristics of the subjects are sum-

marized, the analytical and statistical procedures used in the analysis are identified, and the findings of the data analysis are presented.

Chapter V summarizes the findings and conclusions of the study. Recommendations for application of the study findings in Fire Protection Publications product development and general adult education practice and suggestions for avenues of further research are set forth.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

Learning style refers to the preferred way in which individuals transform and assimilate information. Learning style is the medium or the "how" through which the learner constructs meaning out of stimuli (Kolb, 1984) as reported in Wicklein and Sanders (1987). Every individual has a unique learning style, however, this style may be adjusted depending on the learning task confronting them and the teaching style being used. At best styles are overall patterns that give general direction to learning behavior (Cornett, 1983) as reported in Galbraith and Sanders (1987).

Historical Background

In recognizing patterns in learning styles among elementary children, Dewey (1938) opened up a vast area for future research. Cherry (1981) concluded that adult's learning style patterns were similar in many ways to children's learning patterns as evaluated by Gilley (1975).

In 1962 the Adult Education Section of the office of Education specified four areas as being of growing importance in adult education. Of those (1) To assist in identifying natural trends and problems that have implications for adult education, and (2) To help bring about greater clarity of purpose and policies, more communication and cooperation among adult education groups, and better coordination among both public and private agencies in the use of resources, emphasized the need for more research on adult learners. (Knowles, 1962).

James (1977) concluded that all competencies are not applicable to every individual; hence, the individuality of students should be stressed in the education field. Farmer (1971) suggested that the learning skills of adults have not yet been sufficiently quantified and that adult learners should be tested to determine their learning style patterns.

In the study of adult learning styles, Cherry (1981) found that much of the research that has been conducted in the area of individual learning styles has been in the field of psychology. Cross (1982), reporting on the extensive amount of research of adult learning styles, emphasized that such studies have largely failed to identify learning styles used by adult learners. Therefore, identifying and evaluating learning styles is relatively important for adult learners.

Studies conducted on fire service personnel as a distinguishable identifiable group concerning learning modalities; preferred, perceived, or actual learning styles is lacking in the literature. A search of the ERIC system was conducted with no information found concerning learning styles. The various associations involved in the fire service have not kept any formal records of learning characteristics of fire service personnel.

James (1977) concluded that all competencies are not applicable to every individual; hence, the individuality of students should be stressed in the education field. Farmer (1971) suggested that the learning skills of adults have not yet been sufficiently quantified and that adult learners should be tested to determine their learning style patterns.

Educators have become increasingly interested in identifying the educational needs of the adult learner. Adult students may be the primary target group for efforts to better tailor educational opportunities to meet their learning goals and requirements (Miller and Verduin, 1979). However, a major problem in enhancing adult education programs is that the field has not yet achieved sufficient depth and breadth in its research base. Continuing research efforts are needed to assist educators and adult learning program individuals in developing adult educational programs and curricula.

Individual Learning Styles

By extracting information through the senses to learn, James and Galbraith (1985) referred to this as a perceptual learning style. Galbraith and Sanders (1987) suggested that learning styles could be examined from three broad perspectives: cognitive, affective, and physiological. The cognitive aspects of learning styles includes the way an individual processes, decodes, encodes, stores, and retrieves information (Cornett, 1983) as reported in Galbraith and Sanders (1987). The affective aspect includes emotional and personality characteristics related to motivation, locus of control, interests, persistence, responsibility and sociability (Cornett, 1983). And finally, the physiological aspects of learning style which relate to sensory perception and environmental characteristics, can be examined (Galbraith and Sanders, 1987).

Lovell (1980) pointed out that each individual is unique and that his or her learning will be most effective if his personal strengths and weaknesses in learning styles are taken into account. Thus, to the extent members of the fire service have unique learning styles, they would benefit from different instructional techniques than used for other groups of students.

Fire fighting is largely a physical activity. The training of individuals in the fire service involves a wide range of teaching techniques. The use of printed

materials, as well as visual materials, made it necessary
to examine the perceived learning styles of the fire
service in order to better match the types of learning
activities engaged by various groups within the fire
service. These groups can be categorized into three main
groups, such as the introductory level firefighter, the
company officer, and the upper level management fire
fighter. Adolescent and young adult student groups have
long been the major focal point in the educational system
and more concern should be given to adult groups (Harris,
1980).

All individuals have unique talents and interests,
and the educational system should allow and encourage
students to develop accordingly (Bowen, 1982). For
educators to be able to facilitate such development, indi-
vidual differences should be identified. Hence, identi-
fication and measurement of individual learning styles is
important for adult learners as well as children.

Development of a viable instrument for identifying
and measuring learning styles was pursued by Gilley (1975)
and by French (1975). In a study of children's learning
styles, Gilley (1975) found that his subjects demonstrated
a variety of learning styles. This conclusion was reached
through an evaluation of six perceptual learning styles --
print, aural, interactive, visual, haptic, and kines-
thetic. French (1975) added the olfactory element to the
other six elements of learning styles and called the in-

strument the Multi-Modal Paired Associates Learning Test (MMPALT).

Cherry (1981) revised the olfactory element of the MMPALT and dubbed the revised instrument the MMPALT II. He also developed a self-assessment instrument, the Perceptual Modality Preference Survey (PMPS) for use in conjunction with the MMPALT II (Cherry, 1981). Cherry concluded that adults' learning style patterns were similar in many ways to children's learning patterns as evaluated by Gilley. He recommended that learning styles be further studied using additional populations of learners.

Using Cherry's (1981) self-assessment instrument as a model, PMPS, James and Galbraith (1984) developed the Perceptual Learning Style Inventory (PLSI). The PLSI is a self-assessment instrument designed for obtaining information in a minimum amount of time for ease of individual students, to maximize survey returns.

Summary

Lucas (1985) found definite learning preferences among prime-year adults (aged 40 to 60) and recommended further research on other adult populations for comparative research, as well as Cherry (1981). Wicklein and Sanders (1987) concluded every individual has a preferred way of processing information. Further recommendations were given to utilize the findings from Cherry (1981) and

Lucas' (1985) studies in designing curriculum for adult learners.

Galbraith and Sanders (1987) found in their study of junior college educators that this group of adult learners preferred the following learning styles: print, visual, interactive, aural, haptic, kinesthetic, and olfactory, in that order. Lucas (1985) found in his study of prime-year adult learners, their perceived preferred learning styles were kinesthetic, interactive, visual, aural, haptic, print, and olfactory, in that order.

There is a need for knowledge to interpret if there are definite preferences in learning styles for members of the fire service. By identifying definite preferences in the fire service, Fire Protection Publications can better match the texts and curriculum with the identified learning style preferences of their end users.

CHAPTER III

METHODOLOGY

The purpose of this study was to measure the
preferred perceptual learning styles of members of the
fire service using James and Galbraith's (1984) Perceptual
Learning Style Inventory for evaluation of learning
styles. This study was based on Cherry's (1981) and
Lucas' (1985) recommendation that their study of learning
styles be extended to additional populations of learners.
This chapter describes the subjects tested in the study,
discusses the instrument, the administration of the
instrument, and analysis of the data.

Description of Subjects

Members of the fire service who had purchased
training materials from Fire Protection Publications or
who had asked to be placed on the mailing list for
informational mailings, were randomly sampled for their
perceptions of their own preferred individual learning
styles.

A self-administered questionnaire designed by James
and Galbraith (1984), was mailed to a sample size of 600
fire service personnel. These individuals were randomly

selected from a customer mailing list of 72,000 to receive
a confidence level of .95 percent. This number of
selected sample size was based on the Table for
Determining Needed Size S of a Randomly Chosen Sample From
a Given Finite Population of N Cases such that the Sample
Proportion p will be within $\pm$ .05 of the Population
Proportion p with a 95 percent level of confidence (Linton
and Gallo, 1975).

Evaluation of Instrument

The instrument used was the Perceptual Learning Style
Inventory (PLSI), designed by James and Galbraith (1984),
to be specifically used for self-perception of learning
styles. The questionnaire contained 28 strategies/
techniques through which learning is achieved. Each of
these strategies/techniques correlates to one of the seven
recognized learning styles: print, aural, haptic,
kinesthetic, interactive, visual, and olfactory. The
Perceptual Learning Style Inventory was a self-
administered instrument and the questionnaire required
approximately 15 minutes to complete. No reliability
coefficients or validity tests were available for the
instrument. A copy of the instrument is located in
Appendix A.

Testing Procedures

Six hundred questionnaires were mailed out with a

cover letter explaining the need for the requested information, accompanied with a postage-paid self-addressed envelope (Appendix B). After a four week period from the mailing of the questionnaire, 100 completed questionnaires were returned. A reminder postcard was mailed after four weeks from the original mailing. After six weeks from the original mailing, 50 more question-naires were returned. A total of 13 questionnaires were returned as undeliverable. A total return rate of 27% was achieved. This percentage represented 150 surveys. This was a limitation of this study. However, the distribution of the returned forms represented an even distribution across the total sample of 600. After the time period of six weeks, the results were compiled using information available.

According to a study conducted through the Federal Emergency Management Agency (1988), there are 1,194,141 firefighters in the United States. Of this population 19% are career firefighters and 81% are volunteer firefighters (Federal Emergency Management Agency, 1988).

Another study conducted by the National Volunteer Fire Council, sampled 3,188 volunteer fire fighters from 250 departments in Minnesota, Oregon, Texas, Alabama, and Delaware (Spicer, 1988). Of the sample,

> 96% were male, with an average age of 36. Ninety-two percent had finished high school, 34 percent had some college, and 14 percent were college graduates. The average length of service was 10 years... (p. 2).

This above information was used as a comparison to verify the findings of this study to be unbiased as compared to the results of the above study.

Statistical Analysis of Data

The information collected yielded ordinal data (i.e., ordered information). A Kruskal-Wallis H appropriate for ordered data was used. The Kruskal-Wallis test is a procedure designed to detect differences among several groups on an ordinal response variable (Agresti and Agresti, 1979). The Kruskal-Wallis H is a non-parametric equivalent of a between-subjects analysis of variance (ANOVA). The Kruskal-Wallis H allowed the data to be tested for differences among groups and made both strength of association and specific comparisons possible. The Kruskal-Wallis test statistic has the form (Linton and Gallo, 1975):

$$H = \frac{12}{N(N+1)} \sum_{A=1}^{a} \frac{T_A^2}{n_A} - 3(N+1) \qquad (1)$$

Where T_A = the sum of the ranks for each level of the independent variable,

  n_A = the corresponding number of subjects for each T_A,

  N = the total number of subjects, and

  a = the number of levels of the independent variable.

H is evaluated as X^2 with $a - 1$ df (p. 107).

The PLSI contains 28 strategies/techniques through which learning is achieved. Each of the strategies/ techniques correlate to one of the seven learning styles: print, aural, haptic, kinesthetic, interactive, visual, and olfactory.

The questionnaire asked each respondent to check the strategies/techniques they perceived they learned best. More than one strategy/technique could have been chosen. All of the questionnaire's were numbered as received. A scoring sheet was developed and numbered to match the questionnaire (Appendix C). The answers from the scoring sheet were entered into the computer using a computer statistics package developed by James Bolding (1975). Each scoring sheet corresponded to the file entered into the computer for a total of 150 separate files.

In order to address the research question asked in this study, the results were compiled and weighted to reflect the multiple answers for each respondent. The results were ranked in order of most frequently chosen perceived learning style to the least chosen perceived learning style. After this ranking was achieved a Kruskal-Wallis test was calculated to evaluate if there were any significant differences in perceived learning styles among fire service personnel by the different demographic groups identified in this study: age, sex, size of community, years of service in the fire service, and education level.

An hypothesis was formulated: Ho - There are no significant differences in the preferred perceptual learning styles of fire service personnel by age, education, sex, years in the fire service, or size of community.

CHAPTER IV

ANALYSIS OF DATA

The purpose of this study was to measure the preferred perceptual learning styles of members of the fire service using James and Galbraith (1984) Perceptual Learning Style Inventory for evaluation of learning styles.

To address the research question of this study, an analysis of perceived learning styles of 150 subjects was performed. The measurement instrument, PLSI, was completed by each subject in order to evaluate perceived learning styles of fire service personnel.

The instrument measured the perceived learning styles with respect to seven identified learning styles: aural, haptic, interactive, kinesthetic, olfactory, print, and visual. The data analysis consisted of rank ordering of groups in the fire service by overall perceived learning styles, between groups by sex, age, education, size of community, and years of experience in the fire service.

The findings of the data analysis are presented in this chapter. The first part of this chapter describes the demographic characteristics of the subjects. The second section evaluates the subjects' perceived learning

style preferences, as measured by the PLSI. The third

section compares the subjects' perceived learning styles

by demographic characteristics of the subjects. The

fourth section addresses the research question and null

hypothesis in light of the results of the data analysis.

The last section summarizes the findings and implications

of the data analysis.

Description of Subjects

One hundred and fifty fire service personnel

participated in this study. The demographic charac-

teristics of the subjects are summarized in Table I. The

subjects were fire service personnel from across the

United States. The data sample included 144 males and 6

females. Age groups were broken into four groups, 24

subjects were between the ages of 20 to 30, 77 subjects

were between the ages of 31 to 40, 31 subjects were

between the ages of 40 to 50, and 18 subjects were greater

than 50 years of age. Education levels of the subjects

ranged from 65 with high school diplomas, 50 with two year

degrees/vocational backgrounds, 28 with four year degrees,

and 7 with a graduate degree. Levels of experience in the

fire service less than five years was 19, six to ten years

was 34, eleven to fifteen years was 50, sixteen to twenty

years was 19, and those who had served more than twenty

years was 30. The community size the subjects worked in

was 14 from rural communities less than 2,000, 75 from

TABLE I

DEMOGRAPHIC CHARACTERISTICS OF
FIRE SERVICE PERSONNEL

Characteristic	Number	Percentage
Age		
20 to 30	24	16
31 to 40	77	51
41 to 50	31	21
Greater than 50	18	12
Sex		
Male	144	96
Female	6	4
Education		
High School	65	43
Two Year Degree - Vocational	50	33
Four Year Degree	28	19
Graduate School	7	5
Community Size Department Serves		
Rural less than 2,000	13	9
Small 2,000 to 49,000	75	50
Suburb of city over 50,000	21	14
Urban more than 50,000	41	27
Years Served in the Fire Service		
0 to 5	18	12
6 to 10	33	22
11 to 15	50	33
16 to 20	19	13
More than 20	30	20

(n = 150)

small communities of 2,000 to 49,000, 21 from suburbs of
cities over 50,000, and 41 from urban communities of more
than 50,000.

Perceived Learning Styles as
Measured by PLSI

The self-assessed perceived learning styles of the
fire service personnel in the sample were evaluated using
the PLSI.   The rank orders of each of the seven styles are
summarized in Table II.   On the basis of frequencies at
which the subjects ranked the seven styles, the
interactive style was the highest perceived learning
style, with 126 responses, and the olfactory style was the
least perceived learning style, with 13 responses.   The
highest ranking to the lowest ranking were as follows:
interactive - 126 responses, visual - 118 responses, aural
- 107 responses, print - 95 responses, kinesthetic - 83
responses, haptic - 56 responses, and olfactory - 13
responses.

These results indicate that fire service personnel
prefer to learn by interacting with others through
discussion, and question and answer sessions.   Visual and
aural styles are also perceived as highly preferred ways
to assimilate information.   Haptic with only 37 percent
suggests that hands-on training is not the strongest
method for reinforcement of learning.

TABLE II

SUMMARY OF RANK ORDER OF PERCEIVED LEARNING STYLES OF
FIRE SERVICE PERSONNEL, AS MEASURED BY THE PLSI

Learning Style	Frequency of Responses	Percentage	Rank Order
Interactive	126	84	1
Visual	118	79	2
Aural	107	71	3
Print	95	63	4
Kinesthetic	83	55	5
Haptic	56	37	6
Olfactory	13	9	7

(n = 150)

Comparison of Learning Styles by Groups

The PLSI scores were evaluated for differences in learning styles by demographic characteristics. For those comparisons between groups a Kruskal-Wallis H was performed. Significance tests for each group were made at the 0.05 probability level (Linton and Gallo, 1975).

Age Groups

The 150 subjects were categorized into four groups by age: 20 to 30, 31 to 40, 41 to 50, and greater than 50. An analysis of variance was performed using the Kruskal-Wallis H test. Table III presents the results for the PLSI scores for each perceived learning style. The

calculated H-value, corrected for ties (H = 1.09, df=3) was not significant at the .05 alpha level; therefore, the hypothesis was not rejected with regard to age group.

TABLE III

SUMMARY OF RANK ORDER OF PERCEIVED LEARNING STYLES OF
FIRE SERVICE PERSONNEL FOR AGE GROUPS

| Learning Style | Rank Order of Each Age Group | | | |
	20-30 n = 24	31-40 n = 77	41-50 n = 31	Greater than 50 n = 18
Visual	2	1.5	1	1
Aural	4	5	2	3
Interactive	1	1.5	3	2
Print	3	3	5	4
Kinesthetic	5	4	4	5
Haptic	6	6	6	6
Olfactory	7	7	7	7

(H corrected for ties = 1.09; df=3)

Both age groups 20-30 and 31-40 preferred the interactive learning style and their second choice was visual. This trend was reversed in the older age groups, 41-50 and greater than 50. Of particular interest were the results of the younger age groups with aural as their fourth and fifth choice as opposed to the older groups preferring print as their fifth and fourth choice. Although these figures are not statistically significant at the .05 probability, this demographic breakdown

demonstrates the wide range of preferred perceived
learning styles by age groups.

Size of Community

The respondents were asked what size community their
department served. The community sizes were broken into
four groups: rural with a population size less than 2,000,
small communities with a population size between 2,000 and
49,000, suburb with a population less than 50,000, or
large urban communities with populations more than 50,000.

Table IV presents the results for the PLSI scores for
each perceived learning style. The calculated H-value,
corrected for ties, (H = 0.00, df = 3) was not significant
at the .05 alpha level; therefore, the hypothesis was not
rejected with regard to size of community.

The fire service personnel from smaller communities
each indicated they preferred to learn visually and then
interactive as their next choice. While the fire service
personnel from larger communities reversed in preferred
styles. All other choices had a wide degree of rankings.

Fire Service Experience

The respondents were asked to identify the amount of
time they had been involved in the fire service. This was
categorized into five groups: 0-5 years, 6-10 years, 11-15
years, 16-20 years, and over 20 years of experience.

Table V presents the results for the PLSI scores for each

perceived learning style.   The calculated H-value,

TABLE IV

SUMMARY OF RANK ORDER OF PERCEIVED LEARNING STYLES OF
FIRE SERVICE PERSONNEL BY SIZE OF COMMUNITIES

Learning Style	Rank Order of Size of Community			
	Rural <2,000 n = 14	Small 2,000-49,000 n = 75	Suburb >50,000 n = 21	Urban >50,000 n = 41
Visual	1	1	2	2
Aural	5	3	4. 5	5
Interactive	2	2	1	1
Print	3. 5	4	3	3
Kinesthetic	3. 5	5	4. 5	4
Haptic	6	6	6	6
Olfactory	7	7	7	7

(H corrected for ties = 0. 00; df=3)

corrected for ties, (H = 0. 00, df = 4) was not significant

at the .05 alpha level; therefore, the hypothesis was not

rejected with regard to fire service experience.

While not showing a statistical significance this

group demonstrated that the visual style was preferred by

three of the five groups: 6-10, 16-20, and those fire

service personnel with over 20 years of experience.   There

were no other clear distinctions between groups, other

than the haptic and olfactory was the least preferred

learning style by all the subjects in this group.

TABLE V

SUMMARY OF RANK ORDER OF PERCEIVED LEARNING STYLES OF
FIRE SERVICE PERSONNEL BY YEARS OF FIRE SERVICE
EXPERIENCE

Learning Style	Rank Order by Years of Experience				
	0-5 n = 19	6-10 n = 34	11-15 n = 50	16-20 n = 19	>20 n = 30
Visual	3	1	2	1	1
Aural	4	5	4	3	3
Interactive	1.5	2	1	2	2
Print	1.5	3	3	5	4
Kinesthetic	5	4	5	4	5
Haptic	6	6	6	6	6
Olfactory	7	7	7	7	7

(H corrected for ties = 0.00; df = 4)

Education

Each respondent was asked to identify what level of
education they had completed. These groups were: high
school, two-year degree/vocational, four-year degree, or
graduate degrees. Table VI presents the results for the
PLSI scores for each perceived learning style. The PLSI
scores for each perceived learning style. The calculated
H-value, corrected for ties, (H = 0.00 df = 3) was not
significant at the .05 alpha level; therefore, the
hypothesis was not rejected with regard to education.

TABLE VI

SUMMARY OF RANK ORDER OF PERCEIVED LEARNING STYLES OF
FIRE SERVICE PERSONNEL BY EDUCATION

| Learning | Rank Order by Education | | | |
Style	High School n = 65	Two-Year n = 50	Four-Year n = 28	Graduate n = 7
Visual	1	1. 5	2	2. 5
Aural	3	4. 5	5	6
Interactive	2	1. 5	1	2. 5
Print	4	3	3	1
Kinesthetic	5	4. 5	4	4. 5
Haptic	6	6	6	4. 5
Olfactory	7	7	7	7

(H corrected for ties = 0. 00; df=3)

Although the findings did not demonstrate statistical
significance, there were distinct differences among groups
by education levels. The higher the education levels, the
respondents preferred the print and interactive styles.
The high school and two-year degree respondents perceived
themselves as visual learners and their second most
preferred style was interactive.

Sex

There were 144 males and 6 females that responded to
the PLSI. Table VII presents the results of the PLSI
scores for each perceived learning style. The calculated
H-value, corrected for ties, (H = 0. 00; df = 1) was not

significant at the .05 alpha level; therefore, the hypothesis was not rejected with regard to sex group.

TABLE VII

SUMMARY OF RANK ORDER OF PERCEIVED LEARNING STYLES OF FIRE SERVICE PERSONNEL BY SEX

| Learning Style | Rank Order by Sex | |
	Female n = 6	Male n = 144
Visual	1	1
Aural	4. 5	4
Interactive	2	2
Print	4. 5	5
Kinesthetic	3	3
Haptic	6	6
Olfactory	7	7

(H corrected for ties = 0. 00; df=1)

Research Question

The research question considered in this study was addressed on the basis of the data analysis findings. The findings regarding the research question are summarized as follows.

The research question asked what the perceptual learning styles were of fire service personnel. The results of the PLSI instrument demonstrated all seven learning styles, aural, interactive, print, kinesthetic, haptic, olfactory, and visual were present in fire service

personnel. Their rank orders were evaluated. From Table
II, the following summary of learning styles utilized by
fire service personnel can be made: (1) The interactive
style, was utilized by 126 (84 percent) of the subjects,
with a ranking of 1; (2) The visual style was utilized by
118 (79 percent) of the subjects, with a ranking of 2; (3)
The aural style was utilized by 107 (71 percent) of the
subjects, with a ranking of 3; (4) The print style was
utilized by 95 (63 percent) of the subjects, with a
ranking of 4; (5) The kinesthetic style was utilized by
83 (55 percent) of the subjects, with a ranking of 5; (6)
The haptic style was utilized by 56 (37 percent) of the
subjects, with a ranking of 6; (7) The olfactory style
was utilized by 13 (9 percent) of the subjects, with a
ranking of 7.

<center>Hypothesis</center>

A hypothesis was formulated: Ho - There are no
significant differences in the preferred perceptual
learning styles of fire service personnel by age,
education, sex, years in the fire service, or size of
community.

Each of the five demographic groups surveyed in this
study displayed no significant differences in learning
styles based on an .05 probability. Therefore, there were
no significant differences among the five groups of fire

service personnel sampled by age, education, sex, years in the fire service, and size of the community.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This study evaluated the perceived learning styles of fire service personnel from across the United States. The objective of this study was to extend the findings of previous research on learning styles by evaluating a group of adults not previously studied. This study also assisted Fire Protection Publications in their long-range planning of training materials for fire service personnel. In this chapter, the findings of the study are summarized, the conclusions of the research are presented, and recommendations regarding the application of the findings and avenues for future research are set forth.

Summary of Findings

One research question was addressed in this study. This question was: what are the perceptual learning styles of fire service personnel?

The question was addressed by an analysis of data of 150 fire service personnel. Ranks and scores for seven learning styles; print, aural, interactive, visual, haptic, kinesthetic, and olfactory; were measured using the PLSI instrument. The perceived learning styles of the

subjects were evaluated by examining the self-assessed answers to the PLSI and by assessing variations in learning styles according to demographic characteristics of subjects.

The hypothesis for the study was -- there are no significant differences in the preferred perceptual learning styles of fire service personnel by age, education, sex, years in the fire service, or size of community. The hypothesis was not rejected for all demographics tested; age, education, sex, years in the fire service, and size of the community.

Conclusions

The following conclusions were reached in this study, based on the data analysis presented in Chapter IV.

On the basis of frequencies at which the subjects ranked the seven styles, the interactive style was the highest perceived preferred learning style, and the olfactory style was the least perceived preferred learning style. The highest ranking to the lowest ranking were as follows: interactive, visual, aural, print, kinesthetic, haptic, and olfactory.

These results suggest that fire service personnel prefer to learn by interacting with others through discussion, and question and answer sessions. Visual and aural styles are also perceived as highly preferred ways to assimilate information. Haptic with only 37 percent

suggests that hands-on training is not the strongest method for reinforcement of learning for this sample group of fire service personnel.

There were no significant differences among demographic groups surveyed in this study. However, some groups did display different preferred learning styles as compared to the overall rankings of interactive, visual, aural, print, kinesthetic, haptic, and olfactory. Each of these group's learning styles should be evaluated with regard to the particular type of training materials being developed, to best match those individual group's preferred learning styles.

Age Group

The data suggests the older the population, the more visually oriented they are, with aural and interactive being the second and third choices of this group. Additionally, the younger groups, 20-40, which comprised over two-thirds of the subjects in this study, preferred interactive and visual, with print their third highest choice.

These results suggest that training material for younger entry level and mid-level firefighters, do in fact, learn best by videotape, lecture-discussion groups, and manuals. Whereas, older populations of fire service personnel prefer videotape, slide presentations, and discussion group activities to learn best.

Size of Community

The fire service personnel from smaller communities each preferred to learn visually and then interactive as their next choice. While the fire service personnel from larger communities reversed in preferred styles. All other choices had a wide degree of rankings.

These results do suggest however, that visual training materials would be better utilized in small, and rural fire departments than other types of training materials.

Fire Service Experience

The visual style was preferred by three of the five groups: 6-10, 16-20, and those fire service personnel with over 20 years of experience. The haptic and olfactory was the least preferred learning style by all the subjects in this group. There was no clear indication of an overall preferred learning style.

It may be that newer fire service personnel are joining the fire service with higher education levels. This is perhaps the reason why the 0-5 year group demonstrate important differences in preferred learning styles more in line with the results found for the higher education demographic groups.

Education

As education levels increase with fire service personnel, there was a demonstrated shift in preferred learning styles. Those with a high school education preferred to learn visually, interactively, and aurally as their three highest preferred learning styles. Whereas, those with post-graduate degrees preferred print, visual, and interactive as their three highest choices.

Sex

As with all other groups surveyed the results did not give a significant H-value. There was only a marginal difference in rankings of preferred learning styles for both males and females. The findings of this study suggest that female and male firefighters do not learn significantly different from each other.

It is important that Fire Protection Publications focus on groups of consumers with regard to the types of training materials offered. In this study, fire service personnel were found to be different from other populations of adult learners.

Recommendations

The findings and conclusions of this study have implications both for current fire service personnel/ adult educational practices and for future research directions. With respect to current practice, it is

recommended that training curricula, particularly those directed towards fire service personnel, be designed so as to utilize those learning styles found to be relatively preferred, i.e., the interactive, visual, aural, and print styles. It is further recommended that the preferred learning style of each particular group be given consideration for a better marriage of training materials and learning styles. Curriculum elements that utilize the less preferred learning style, i.e., kinesthetic, haptic, and olfactory, should be deemphasized in curriculum development for fire service personnel.

Recommendations for future research are as follows:

1. While a sample size of 150 is an adequate number to base this study upon, larger sample sizes are recommended.

2. As there is very little research on the learning styles of adult groups as a whole, and particularly fire service personnel; it is recommended that further studies be conducted analyzing learning and training habits of fire service personnel and their instructors.

3. A comparison of these findings with the findings of other studies concerning adult populations is needed to further develop guidelines for curriculum development for all areas of vocational adult populations.

4. Other studies using other than the physiological aspects should be undertaken to further investigate this

population of adult learners and their predominant learning styles.

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APPENDIXES

APPENDIX A

PERCEPTUAL LEARNING STYLE INVENTORY

PERCEPTUAL LEARNING STYLE INVENTORY

<u>Check</u> below the strategies/techniques through which you <u>think</u> <u>you</u> learn best. You may choose more than one.

1. _____ motion pictures
2. _____ lecture, information-giving
3. _____ group discussions
4. _____ reading assignments
5. _____ role playing with you as a participant
6. _____ project construction
7. _____ odor discrimination activities
8. _____ television programs
9. _____ audiotapes
10. _____ participant in panel discussions
11. _____ written reports
12. _____ nonverbal/body movements
13. _____ drawing, painting, or sculpturing
14. _____ tasting
15. _____ slides
16. _____ records
17. _____ question-answer sessions
18. _____ independent reading
19. _____ physical motion activities
20. _____ model building
21. _____ scented materials (such as scratch and sniff)
22. _____ graphs, tables, and charts
23. _____ recitations by others
24. _____ interviews
25. _____ writing
26. _____ participant in physical games
27. _____ touching objects
28. _____ photographs

Please fill out the following personal information.

How many years have you served in the fire service?

_____ 0 - 5
_____ 6 - 10
_____ 11 - 15
_____ 16 - 20
_____ more than 20

How large is the community your department is assigned to protect?

_____ rural less than 2000
_____ small 2000 - 49,000
_____ suburb of city over 50,000
_____ Urban more than 50,000

What is your age?

_____ 20 - 30
_____ 31 - 40
_____ 41 - 50
_____ greater than 50

What level of education have you completed?

_____ High School
_____ Two Year Degree - Vocational
_____ Four Year Degree Program
_____ Graduate School

What is your sex? _____ Male _____ Female

Thank you for answering the above.

Please place your completed questionnaire in the self-addressed envelope provided and return as soon as possible. The results of this study will be provided upon request.

APPENDIX B

SAMPLE LETTER

⬜⬜⬜

Oklahoma State University

FIRE PROTECTION PUBLICATIONS

May 5, 1988

REGARDING: **PERCEPTUAL LEARNING STYLE INVENTORY**

This questionnaire is designed to gather information on perceptual learning styles. The population of this study are members of the fire service in all capacities, chiefs, instructors, and firefighters.

This study is part of a research project for graduate studies as well as Fire Protection Publications. Your response can help us in determining how best to design training manuals to assist you as instructors to teach from, as well as facilitating learning.

The questionnaire will take less than five minutes to complete. Your response will be strictly confidential. Due to the importance of this study, please return the questionnaire by May 15th. A self-addressed, postage paid envelope has been provided for your convenience.

If you would like to know your individual learning style, please provide a self-addressed stamped envelope and we will return your results to you.

Your assistance and cooperation in this project is deeply appreciated.

Sincerely,

Teresa Tackett

Teresa Tackett
Marketing Associate
Fire Protection Publications

**CENTENNIAL
DECADE**
1980 • 1990

APPENDIX C

PLSI SCORING SHEET

PLSI - Scoring Sheet

Strategy Numbers	Style
I. I, 8, 15, 22, 28	Visual
2. 2, 9, 16, 23	Aural
3. 3, 10, 17, 24	Interactive
4. 4, 11, 18, 25	Print
5. 5, 12, 19, 26	Kinesthetic
6. 6, 13, 20, 27	Haptic
7. 7, 14, 21	Olfactory

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

12. _____

13. _____

15. _____

16. _____

17. _____

18. _____

19. _____

20. _____

21. _____

22. _____

23. _____

24. _____

25. _____

26. _____

VITA

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