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Learning Preferences of Commercial Fishermen

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**Learning Preferences of
Commercial Fishermen**

By

Robert W. Miller

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in Curriculum and Instruction
Department of Adult, Career and Higher Education
College of Education
University of South Florida

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Keywords: Commercial Fishing, Safety Education, Learner Preferences, Adult
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Dedication

This research and manuscript is dedicated first and foremost to my parents, Mr. Robert E. Miller and Mrs. Naomi Johnson Sigmon whose beliefs and dedications allowed this to be possible.

Secondly

To the commercial fishermen who lost their lives at sea, you may be gone, but you are never forgotten.

Finally

To all those who commercial fish, their families and friends, instructors, educators, and trainers who work with the fishermen, the USCG and their support agencies, and all the government agencies who work to save lives in commercial fishing.

It is my sincere hope that this research leads us to a greater understanding of the learning preferences of not only the commercial fishermen, but to understanding all workers as learners. The potential to create highly effective and practical safety education for all workers is a priority so maybe one day no one dies at work.

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Abstract

This study surveyed 435 commercial fishermen across eight coastal regions of the United States where commercial fishing takes place. The regions of the study included: Northeast Atlantic, Mid-Atlantic, Southeast Atlantic, Gulf of Mexico, Great Lakes, Southern Pacific, Pacific Northwest, and Alaska. Participants were asked to complete the *Commercial Fishing Worker Survey* (CFWS), which is a survey instrument consisting of an approved, adapted version of the *Index of Learning Styles* instrument (ILS) combined with a demographic section which included questions designed to obtain data regarding the four variables of the study: age, education level, captain's license status, and method of fishing. The instrument was designed to provide data sufficient to answer the three research questions of the study.

1. What are the learning preferences of commercial fishermen?
2. Are there differences in the learning preferences of commercial fishermen across the eight geographical regions of the study?
3. Are there differences in the learning preferences of commercial fishermen based on the demographical variables?

The commercial fishermen showed obvious inclinations toward specific learning preference dimensions. The fishermen indicated that they preferred the active (rather than the reflective) dimension, the sensing (rather than the intuitive) dimension, the visual (rather than the verbal) dimension, and the sequential (rather than the global)

dimension. The participant's responses were similar across the eight regions. Where differences existed, they were related to the sensing/intuitive and sequential/global learning preferences dimensions. Region 8 Alaska appeared to have stronger sensing and sequential learning preferences than the other regions.

Age did not appear to influence the learning preferences of the fishermen. The majority of the respondents indicated they were high school graduates. However, education did not appear to affect the learning preferences of the fishermen. Captain's license status had no influence on the learning preferences of the commercial fishermen, since the majority of the respondents did not possess a captain's license.

Respondents indicated that the largest percentage of commercial fishing used net fishing methods as their primary means of fishing. For the majority of the commercial fishermen, method of fishing did not appear to influence the learning preferences of commercial fishermen. However, net and trap fishermen exhibited significant differences related to the sensing/intuitive and sequential/global learning preference dimensions and reported more preference for the sequential/global learning preference dimensions than fishermen using other methods of fishing. Implications and recommendations for further study are enumerated in the last chapter.

Chapter 1

Introduction

Commercial fishing is a global scale industry due to the demand for seafood products by the world's human population. As a result of the demand for seafood products and the revenue generated by the sale of the catches, commercial fishermen expose themselves to the dangers of the sea (U.S. BLS) (2010). This exposure to weather and dangerous conditions both at sea and on board the vessel combine to produce a life-threatening situation where commercial fishermen have seconds in an emergency to react to save their lives. Training can improve their chance of survival, but it must be so ingrained, they they react automatically to the situation.

According to the United States Bureau of Labor Statistics (U.S. BLS) (2010), commercial fishing ranks as one of the most dangerous occupations in the United States. Commercial fishing dangers include hazardous working conditions, physical labor, excessive work hours, and exposure to harsh weather conditions. During the 2000-2010 period, an annual average of 46 commercial fishing worker deaths occurred using the U.S. BLS fatality rate formula (this rate translates to 124 deaths per 100,000 workers), compared with an annual average of 5,466 deaths (4 per 100,000 workers) among all the U.S. industry workers combined nationally. See Table 1 for a further breakdown of commercial fishing industry fatality rates by specific fishery and location of the fishery.

Table 1

Commercial Fishing Fatalities and Fatality Rates by Fishery

Fishery	Fatalities <i>N</i>	FTE <i>n</i>	Annual rate per 100,000 FTEs
Ground fish			
Northeast multispecies ground fish	26	4,340	600
Atlantic snapper/grouper	6	3,622	170
Alaska halibut	10	7,519	130
Alaska cod	26	21,327	120
Alaska sole	21	—†	—
Gulf of Mexico snapper/grouper	10	—	—
Shellfish			
Atlantic scallops	44	10,384	425
West Coast Dungeness crab¶	25	8,092	310
Bering Sea and Aleutian Islands	12	4,658	260
Crab			
Gulf of Mexico shrimp	55	—	—
Northeast lobster	18	—	—
Gulf of Mexico oyster	11	—	—
Pelagic fish			
Alaska salmon	39	34,287	115
West Coast tribal salmon	10	—	—
Other fisheries**	165	—	—
Unspecified	26	—	—

Note. Full-time Equivalent (FTE) Employee by Fishery Type--United States, 2000-2009. United States Bureau of Labor Statistics, 2010

Rates calculated by dividing the total number of fatalities for the 10-year period by total annual FTEs.

† Unknown

§ Includes the Northeast and Mid-Atlantic regions.

¶ Excludes two Washington tribal crab fatalities, which are not included in the FTE count.

** Fisheries with <10 fatalities each.

This documented fatality rate offers evidence that a serious safety problem exists within commercial fishing and provides evidence for the critical need of effective commercial fishing safety in the U.S. The high fatality rate has prompted researchers to begin research attempting to identify the root causes of this fatality rate. See Figure 1 for a graph of the root causes of commercial fishing fatalities. Lincoln and Conway (1999) conducted research that examined root causes of injuries and fatalities on board commercial fishing vessels and focused on the examination of physical characteristics of the fishing vessels and the associated deck equipment.

Lincoln and Conway's (1999) study included the characteristics of the fishermen themselves as related to their level of training and the use of available safety equipment while working on the deck of the vessel. The study concluded that the primary cause of fishing-related fatalities was drowning and, of those, 65% were the result of falling overboard without a personal flotation device (PFD). See Table 2 for the causes of commercial fishing fatalities. Lincoln and Conway concluded that the fishermen had marginal knowledge of the use of safety equipment and little knowledge of the products available that should be worn while working on deck to improve safety.

Under the auspices of The National Institute of Occupational Safety and Health (NIOSH), Lincoln and Lucas (2010) piloted a two-part research project that gave selected fishing vessel crews various PFDs to be worn while working on deck. The use of the new PFDs was complemented with formal marine safety training provided by the Alaska Marine Safety Education Association (AMSEA) instructors. The study concluded that the high industry fatality rates were caused by the lack of safety training for commercial fishermen and the lack of knowledge of available lifesaving products.

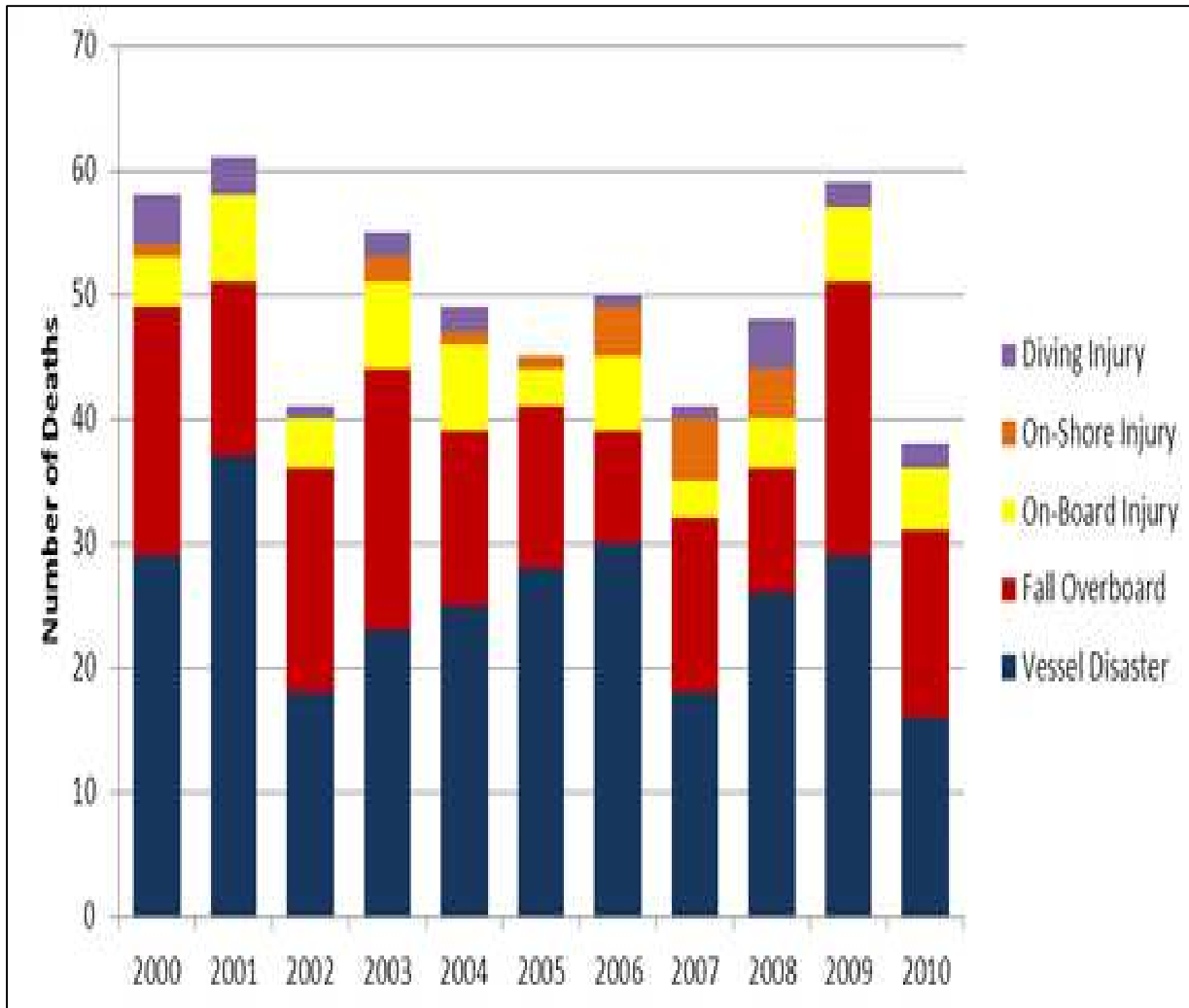


Figure 1. U.S. commercial fishing fatalities by year and incident type 2000-2010. By Lincoln, J. J., & Lucas, D. D. (2010). Commercial fishing deaths--United States, 2000-2009. *Morbidity and Mortality Weekly Report (MMWR)*, 59(27), 842-845.

Note. There were 279 fatalities that occurred from 148 separate vessel disasters. Of these incidents with known causes, severe weather conditions contributed to 148 (61%) of the fatal vessel disasters

- 40 (28%) were initiated by flooding.
- 27 (19%) were initiated by vessel instability

Among the 170 fatalities that resulted from a person falling overboard and with known causes:

- 26 (18%) were initiated by being struck by a large wave
- 90 (57%) were not witnessed

Regardless of cause, none (0%) of the fall-overboard victims was wearing a personal flotation device (PFD).

Table 2

Number and Percentages of Incidents and Initial Causes Associated With Commercial Fishing Fatalities

Incident/Cause	<i>n</i>	%†
Vessel disaster	148§	---
Flooding	37	28
Instability	24	18
Struck by large wave	23	18
Collision/Allision	13	10
Propeller entanglement	6	5
Fire/Explosion	6	5
Struck by wind gust	5	4
Gear caught on bottom	4	3
Engine failure	4	3
Crossing hazardous bar	4	3
Struck rocks/bottom	3	2
Steering failure	1	1
Listing	1	1
Falls overboard	155¶	---
Trip/Slip	43	33
Lost balance	34	26
Gear entanglement	21	16
Jumped	16	12
Knocked by gear/object	11	8
Washed over	7	5
Other	88	---
On-board injury	51	58
Diving related	19	22
On-shore	18	20

Note. *N* = 504. Reproduced from *Number and Percentages of Incidents and Initial Causes Associated with Commercial Fishing Fatalities---United States, 2000-2009* Lincoln, J. J., & Lucas, D. D. (2010)

† Percentage of category. Missing values were excluded from percentage calculations. Totals may not equal 100% due to rounding.

Among a total of 504 fatalities, 261 were associated with 148 vessel disasters, 155 with falls overboard, and 88 with other causes.

§ Includes 17 incidents of unknown cause.

¶ Includes 23 incidents of unknown cause.

The 2010 Lincoln and Lucas study offered evidence that no vessels that participated in the study experienced a fatality during the study period. The study determined that formal marine safety training combined with advances in personal flotation devices represented the most effective means to prevent fatalities on board commercial fishing vessels.

Perkins (1995) conducted an evaluation on the 20 years of training efforts in the Pacific Northwest by AMSEA and confirmed the findings of earlier studies that effective education is the critical key to reducing fatalities in commercial fishing. However, Perkins' study also verified that the fatality rates in other fishing areas of the United States remained at approximately 200% of national industry averages.

A Centers for Disease Control (CDC) (2002) study recognized that the efforts of AMSEA in training the commercial fishing fleet in the Pacific Northwest. This had reduced the fatality rate by over 55% in the region. The 2002 study determined that the high fatality rate in other fishing regions of the US was directly related to the lack of safety education opportunities for the commercial fishermen in the lower 48 states.

According to (DeAlteris, Wing, and Castro, (1989) and Perkins (1995), organizations such as AMSEA and others have developed curricula, which have a proven record of reducing fatalities in commercial fishing. However, the current curricula are based on teacher-centered methods of instruction that may not be the most effective method of instruction for the learner. Current education best practices indicate that learner-centered methods of instruction enhance vocational education endeavors (Nelson, 1999).

The need to determine the learning preferences of commercial fishermen is necessary, since learners have certain ideal learning methods, which comprise their learning preferences. In a layman's definition, individual learners have a preferred method of learning (i.e., some learn better through visual means, while others prefer reading a book or listening to a lecture). An understanding of the learning preferences of commercial fishermen may be instrumental in reducing commercial fishing fatalities.

It was the intent of this research to establish a baseline of knowledge regarding the learning preferences of commercial fishermen. This enhanced understanding of the learning preferences of the fishermen provides valuable insight and adds critical knowledge to the commercial fishing safety educators, and to the arenas of both vocational education and occupational safety. This creation of foundational knowledge concerning the commercial fishermen as adult learners provides for both future research and assistance in developing effective educational opportunities for commercial fishermen and other high-risk industry workers. The creation of learner-oriented safety education could possibly reduce the number of workplace injuries and fatalities across other U.S. industries.

Statement of Problem

Previous studies have concluded that proper training on the use of safety equipment and emergency procedures has been paramount to reducing the number of fatalities in commercial fishing (Perkins, 1995). The need to understand how the commercial fishermen learn continues to be a critical issue in developing effective educational programs for commercial fishermen. While extensive research into the causes of fatalities in commercial fishing had been conducted, there was no research examining

the learning preferences of commercial fishermen.

Research into the learning preferences of commercial fishermen can provide insight on how to adapt instructional methods to best suit learning preferences of commercial fishermen. Previous research into learning preferences of commercial fishermen was lacking since no body of knowledge existed that has examined the learning preferences of commercial fishermen.

Purpose and Objectives

The purpose of this research was to identify the learning preferences of commercial fishermen in order to provide effective educational programs for commercial fishermen.

The objectives of this research were to establish foundational knowledge regarding

- a. The learning preferences of commercial fishermen, related to age, education level, captains license status, and method of fishing.
- b. The similarities and differences in learning preferences of commercial fishermen in relation to the United States geographical commercial fishing regions.

The following research questions were developed to provide insight into the learning preferences of commercial fishermen:

1. What are the learning preferences of commercial fishermen?
2. Are there differences in the learning preferences of commercial fishermen across the eight geographical regions of the study?
3. Are there differences in the learning preferences of commercial fishermen based on the demographical variables? The demographic variables include:
 - a. Age,
 - b. Education level,

- c. Captain's license status, and
- d. Method of fishing.

Significance of the Study

The significance of this research was to create a body of knowledge concerning the learning preferences of commercial fishermen. This enhanced knowledge may provide valuable information to future commercial fishing safety educators as an aid in the development of learner-targeted educational programs for commercial fishermen.

While the primary focus of this research was to add new knowledge concerning the learning preferences of commercial fishermen, the information may also enhance the development of critical safety education programs for other industries. This research may also be significant to other high-risk industries such as construction and logging where similarities within the worker populations might exist. These high-risk industries are often secondary employment choices for commercial fishermen during the periods that commercial fishing is closed, due to legally regulated fishing season (e.g., the highly regulated red snapper fishing season in the Gulf of Mexico which is only opens for three months a year).

Limitations

Most research has limitations which may impact the scope of the study. Two limitations of this study are enumerated below:

1. The use of a self-report instrument may cause a limitation since many individuals do not understand their own learning preferences.
2. There may be difficulties with the instrument, because English reading skills are required. For example, the Gulf of Mexico region has some commercial fishermen who do not read English. Fishermen lacking English reading skills were excluded from the study.

3. Access to the long-line fishermen was inhibited due to those fishermen being at sea for extended time periods. They were unable to attend the scheduled safety courses and/or unavailable to participate in this study because of their being at sea fishing. The fact that the long-line fishermen are away at sea for extended periods made this segment of the fishing population very difficult to access for this study.

Definition of Terms

For the purposes of this research, the following definitions of relevant terms are provided below.

Captain's License. A formal document, also known as a Merchant Mariners license issued by the United States Coast Guard to those seeking to serve as the master or captain of a vessel for hire.

Coast Guard. The United States Coast Guard is a military branch under the U.S. Department of Homeland Security, which is charged with protecting America's coastlines.

Commercial Fishermen. A person who is employed in the commercial fishing industry, earning at least 50% of their yearly income from fishing and who are physically on board a commercial fishing vessel engaged in the harvest of seafood resources for sale for profit.

Commercial Fishing. Fishing in a for-profit manner, where the primary objective is the harvest of marine resources to be sold for a monetary gain.

Commercial Fishing Methods. The commercial fishing industry uses many methods to harvest seafood products. Appendix A provides illustrations and additional information on the methods commonly used in commercial fishing. See Appendix A, Figure A1 for the Illustration of various commercial fishing methods discussed in this study. Typical commercial fishing methods are classified into four broad categories and are defined below.

Rod Fishing Methods.

The common fishing methods used to catch bottom-dwelling species of fish are discussed below.

Bandit Fishing. A method of fishing for bottom-dwelling fish using a permanently mounted bandit reel, which is a device mounted to the vessel which employs a large metal spool fitted with wire cable driven by an electric motor that retrieves the fish once hooked. See Figure A2 for an

illustration for bandit fishing equipment. This type of method is used for deep-water fish such as Cubrera snapper and large grouper species that are found in water depths exceeding 600 feet.

Conventional Rod and Reel. This method of fishing is familiar to the average person using a reel mounted on a fishing rod held in the hands of the fisherman. See Figure A3 for illustration rod-and-reel fishing. This method is used for both pelagic (migratory offshore fish) and bottom-dwelling species of fish

Trolling Method. A fishing method used by both commercial and recreational fishermen to target mid- and top-water game fish such as wahoo or tuna by pulling bait or artificial lures in a pattern behind the boat to mimic a school of baitfish. See Figure A4 for illustration of trolling method.

Trap Fishing Methods

Four common types of nets fishing methods are discussed below.

Fish Trap. A device used to trap free-swimming fish, normally placed in rivers or areas that fish must travel past. See Figure A5 for an illustration of a fish trap.

Traps. Traps are structures designed to sink to the seafloor, which target bottom-dwelling species, are normally constructed of wire or wood, and utilize a bait source to attract desired species. See Figures A5, A6, A7, & A8 for illustrations of examples of types of traps and how traps are stored on the fishing vessel. Traps are normally deployed and left on the bottom (soaking) for 1 to 5 days depending on the species sought.

Long-line Fishing Method.

A method of fishing using a 2-3 mile long cable called the ground line. The ground line has a large weight or anchor attached to the end of the cable to sink the ground line to the seafloor. 3000 to 5000 sections of monofilament or wire fishing line (leaders) with baited hooks are attached to the main ground line, as it is sunk to the seafloor. This method is used to target large bottom feeding species such as swordfish, tuna, grouper, snapper and other deep-water species. See Figure A9 for the illustration depicting the ground line, attached leaders, and baited hooks in a typical configuration used while fishing.

Net Fishing Methods.

Four common types of net fishing methods are discussed below.

Gill Net Fishing. A type of fishery utilizing nets that have mesh sized to target specific sizes of the species sought. The mesh size of the net allows fish below a certain size to pass through the net unharmed, while targeting fish of suitable size. Larger fish can only pass partially through the mesh, therefore entrapping the fish because it cannot reverse its course due to the fish's gill plates becoming entangled in the mesh of the net, which traps the fish in the net mesh. This method can be used in either drift or bottom set configurations. See Figures A10 & A11 for illustrations depicting both drift and bottom set configurations.

Trawl Net Fishing. A net fishing method used to target mid-water and bottom-dwelling species by using a net that is pulled behind a moving vessel, held open by long poles mounted on the vessel, which are spread out from the boat to open the net. See Figures A12 & A13 for the illustrations of trawl fishing methods. Targeted species are swept into the net and are forced into the bag section of the net to be collected. Trawl nets are equipped with special devices made into the nets that exclude or eject unwanted or protected species such as turtles and porpoises from the net. The collected fish in the bag section are then brought aboard the fishing vessel using large winches to be sorted for targeted species, while returning unwanted species to the sea.

Purse Seining. A method of net fishing used to target mid- to top-water dwelling fish. When a school of fish is located, the net is deployed and pulled by a smaller support vessel to encircle the entire school of fish. Once the school is encircled by the net, the net is closed by pulling the attached ropes which close the net in a draw string manner that forms a large bag (purse) entrapping the fish until the net is winched on board the fishing vessel for sorting and harvesting. See Figure A14 for an illustration of purse net fishing in action.

Commercial Fishing Regulations. Federal and state regulations requiring commercial fishing vessels and crews to follow specific requirements for safety at sea and the catch and sale of aquatic products, shellfish, and fish.

Fishery. A combination of people, boats, and equipment targeting specific species of fish or shellfish, using specific methods related to the targeted species and regulated by fishery managers regarding equipment, seasons, and limits of catch.

Geographical Region. For this study, the continental United States is divided into eight areas to allow for comparison between regions. The eight geographical regions for this study are:

1. *Northeast Atlantic* region is defined as the Atlantic coastal areas beginning at the United States-Canadian border in Maine extending southward to Cape May, New Jersey.
2. *Mid-Atlantic* region is defined as the Atlantic coastal areas beginning at Cape May, New Jersey and extending southward to the North Carolina-South Carolina state border.
3. *Southeast Atlantic* region is defined as the Atlantic coastal areas beginning at the North Carolina-South Carolina border and extending southward to Key West, Florida.
4. *Gulf of Mexico* region is defined as the coastal Gulf of Mexico areas beginning in Key West, Florida, and extending north and west along the coastal region of Florida, continuing westward along the coastal Gulf of Mexico areas to the Texas border, and continues southward along the Texas coast ending at the United States-Mexico border.
5. *Great Lakes* region is defined as the United States territorial waters of the Great Lakes. The region begins on the shorelines of those states bordering the five Great Lakes to the United States-Canadian border.
6. *Southern Pacific* region is defined at the Pacific coastal waters beginning at the United States–Mexico boundary extending northward to the California-Oregon border.
7. *Pacific Northwest* region is defined as the coastal areas beginning at the California –Oregon border extending northward to the United States-Canadian border.
8. *Alaska* region is defined as the coastal waters of Alaska beginning at the United States-Canadian boundary and continuing westward and northward to include all coastal waters all related bays and fiords which are geographically known to represent all the coastal area waters of Alaska culminating at the Arctic Ocean in Barrow, Alaska.

Index of Learning Styles. A 44-question self-report instrument created by Felder and Solomon (n.d.) to measure learning preferences of engineering students initially, the instrument has been used in identifying learning preferences in adult students with over one million adult learners taking the instrument in its online format.

Learner-centered education. Instructional method that utilizes approaches that present knowledge in a manner designed to ensure that the instructional method is centered on the student rather than the instructor's typical method of instruction.

Learning preferences. Tendencies exhibited by a learner based on an assessment to determine the learning preferences of the student. This study used the *Index of Learning Styles* instrument (Felder & Solomon, n.d.) that examined the eight learning preference dimensions that are classified as inverse or mirrored pairs (e.g., active/ reflective, etc.). The eight learning preference dimensions used in this study are provided below (Felder & Solomon, n.d.).

Active learners retain and understand information by having an active role in the educational process. This type of learner prefers to apply the content through discussion, application, or explaining it to others.

Reflective learners need time to think and absorb new learning material and often this reflection period is difficult in fast-paced classes. The reflective learner prefers to think about things before applying application.

Sensing learners like learning facts and proven concepts and tend to work well with established methods. The sensing learner dislikes any unexpected complications or testing on subject matter that was not adequately covered in class. The sensing learner generally prefers that the content be grounded on real-world application.

Intuitive learners like to connect the dots since they prefer to discover possibilities and relationships. Intuitive learners are the innovators and often work at a fast pace. This type of learner has a disdain for repetition and enjoys grasping new ideas or theories.

Visual learners represent the highest majority of learners. This learner prefers new information be provided in a visual means such as pictures, diagrams, books or media, and other visual demonstrations. These learners remember what they see. This type of learner is often at a disadvantage in college, as many college courses provide little visual input relying more on lecture or discussion.

Verbal learners are the inverse of visual learners, as they prefer that information be disseminated through the spoken word. This type of learners does well in oral presentations and demonstrations involving lecture presentations.

Sequential learners gain knowledge best when instruction is delivered in small stages. Sequential learners gain understanding in linear steps where new information is presented in structured segments occurring in a logical order.

Global learners learn in large jumps of understanding and they often have the ability to develop the big picture simply by absorbing the material randomly, while often disregarding apparent connections. Global learners tend to be complex problem solvers and often perceive other connections related to the aspects of the big picture that other types of learners might not make.

Glossary of Acronyms

Due to the large number of abbreviations used throughout his research study, the following glossary of acronyms is presented to facilitate ease of reading and understanding.

AMSEA	Alaska Marine Safety Educators Association
CDC	Centers for Disease Control
CFR	United States Code of Federal Regulations
CFVSA	Commercial Fishing Vessel Safety Act of 1988
CFVSRA	Commercial Fishing Vessel Safety Reauthorization Act of 2010
CFWS	<i>Commercial Fishing Worker Survey</i>
EDC	Emergency Drill Conductor
ILS	<i>Index of Learning Styles</i>
IMO	International Maritime Organization
LOM	<i>Learning Orientation Model</i>
LOQ	<i>Learner Orientation Questionnaire</i>
MSI	Marine Safety Instructors
MSIT	Marine Safety Instructor Training
MSO	Marine Safety Office
NIOSH	National Institute of Occupational Safety and Health
PFD	Personal Floation Device
TWIC	Transportation Worker Identification Credential
U.S. BLS	United Sates Bureau of Labor Statistics
U.S. DHS	United States Department of Homeland Security

Organization of the Study

Chapter 1 introduces the study, and presents the statement of problem, purpose and objectives, significance of the study, limitations of the study, definitions of terms, glossary of acronyms, and the organization of the study. Chapter 2 contains a review of the relevant literature pertaining to the topics of Commercial Fishing, Adult Education, Learning Preferences, and Summary. Chapter 3 addresses the methods used in this study of commercial fishermen, including discussion of the research design, population and sample, instrumentation, data collection, data analysis and summary.

Chapter 4 presents the findings of the study and provides a demographic profile of the respondents, analysis of research question one, analysis of research question two analysis of research question three, and observations. Chapter 5 presents a summary of the study, conclusions, implications and recommendations for future research.

Chapter 2

Review of Literature

The purpose of this research was to identify the learning preferences of commercial fishermen in order to provide effective educational programs for commercial fishermen. While no specific literature was found concerning the learning preferences of commercial fishermen, there was literature available for review concerning other aspects connected either directly or indirectly to the learning preferences of commercial fishermen, such as adult education theory and practices and various advanced instructional methods.

The parts of this chapter include a review of the available literature regarding commercial fishing, adult education, learner preferences, and summary. It also includes discussion of available educational programs and the commercial fishing safety education organizations and instructors. This was necessary for an increased understanding of the commercial fishing industry and how identifying learning preferences of commercial fishermen could affect critical safety education and curriculums for those employed in the industry.

Commercial Fishing

Commercial fishing is a time-honored occupation tracing its roots back to ancient times when fishermen would bring their daily catches to local markets to sell and barter their catches. Commercial fishing today still relies on the skill and acceptance of risk of

the fishermen to provide fresh seafood to the world's population. Commercial fishing occurs in every country, where bodies of water are available for fishing. Commercial fishing often represents a large economic resource for the respective country. Culver, Bierwagen, Burkett, Cantral, Davidson, and Stockdon (2012) explain that the United States annual commercial fishing catch is valued at approximately \$15 billion dollars a year and produces an larger industry directly linked with transportation, sales, and food industries employing an estimated 6.9 million workers within the entire commercial seafood industry. They continue to provide information that the seafood industry and its associated industries contribute an estimated \$70 billion dollars annually to the U.S. economy.

Commercial fishermen. The need to discuss commercial fishermen outside the context of adult learning is necessary to understand and clarify about the type of people who are commercial fishermen in this study. Pollnac and Poggie (1990) stated that commercial fishermen have provided a vital role in not only providing a large food source for the country since the beginning of the United States, but also for the creation and development of the coastal communities of the country. The quaint fishing villages and their associated culture were created by the fishermen and their families over time. The fishing villages are normally found near an inlet or other passage to the sea, and often have evolved around a fish house. The fish house is the common center point for commercial fishermen, as much of the everyday business of commercial fishing revolves around the fish house. The fish house provides not only a place to sell their catch, but also serves as a social gathering point for the fishermen. The role of the fish house is much more complex than it appears at the surface. The fish house serves as

a type of bank for the fishermen, since the fish house provides bait, ice, fuel, and supplies to the commercial fishermen on a credit basis with the bill deducted from each boat's catch. In some instances, the fish house actually has a lien against the vessel until the bill is paid, this results in some of the larger fish houses around the country end up owning many commercial fishing vessels whose catches were not enough to cover their debts. The fish houses normally allow the fishermen to continue to operate their boats, but the fish house receives a large portion of the catch proceeds until the debts are paid off.

The culture of commercial fishermen is complex due to regional cultural differences and the large variance in ethnic backgrounds of the people involved in commercial fishing (Pollnac & Poggie, 1990). This variance began with the first commercial fishermen who immigrated to the new world and continued to grow as more ethnicities immigrate into the U.S. Due to the varying cultural aspects, beliefs, and attitudes within the individual ethnic groups, any attempt to classify their individual cultural/ethnic backgrounds would be outside the scope of this study. However, Pollnac and Poggie (1990) contend that there are some commonalities in commercial fishermen that can be generalized across the country.

Commercial fishermen are historically viewed as noble providers who challenge the seas to provide food for the community and people. Normally they are working class people who are carrying on an honored family tradition often spanning across tens of decades. The fishermen as individuals are as different and complex as any individuals employed in any occupation (Pollnac & Poggie, 1990). It must be noted that a difference in the demographics of commercial fishermen themselves not only varies

substantially across individual fisheries and regions of the country, but across the individual vessel crews. Typically there are notable differences between the captain and crewmembers of the fishing vessel related to individual demographics such as age, education, experience, commitment, financial stake, earnings, and health (Pollnac & Poggie, 1990).

T. Culpeper (USCG Region 7 Commercial fishing vessel safety examiner, personal communication, November 14, 2013) discussed multiple observations concerning the characteristics of commercial fishermen. He stated that vessel masters tend to be older with more practical experience than crewmembers, while crewmembers often have more formal education and less experiential education than the master. Most commercial fishermen regardless of whether they are the vessel master or crew are high school graduates, as a result of the long-term trend of mandatory educational standards of the greater society. He continues that the masters tend to have higher incomes than crewmembers due to larger pay shares of the catch value and often the financial stake of owning the vessel. The vessel masters also are at higher health risks for stress-related health disorders due to the pressures and responsibilities of their position.

Crewmembers on the other hand tend to suffer fewer fishing-related health issues excluding injuries occurring on the vessel. Crewmembers are less likely to have health insurance and may be more inclined toward risky behaviors. Crewmembers tend to be younger than vessel masters, which put them at higher risk for common societal issues outside of commercial fishing such as high-risk sports, illegal activities, and substance abuse.

Captain's license. One of the independent variables of this study, captain's license is discussed below for understanding. A captain's license is a Coast Guard issued merchant mariner document required for those serving as master or captain of a vessel for hire or a vessel that carries paying passengers. The Coast Guard established regulatory procedures for individuals to obtain a captain's license. The process to obtain a captain's license begins with an apprenticeship period, as it is necessary to have a minimum of 360 days of actual sea service and also requires the individual to obtain a Transportation Worker Identification Card (TWIC) (United States Coast Guard, 2014). The process to obtain the TWIC requires a background check, fingerprinting, and citizenship verification by the United States Department of Homeland Security (U.S. DHS) of the individual before the secure document is issued.

Once these requirements are met, the individual makes application with the Coast Guard. The application process requires the applicant to provide a signed consent for a comprehensive background check by the Federal Bureau of Investigation, provide three letters of recommendation attesting to character and mariner abilities, complete through physical and medical exams, and undergo extensive drug and alcohol screening at Coast Guard approved medical facility (United States Coast Guard, 2014).

Once the seaman has submitted the completed application and the Coast Guard has approved the application, the seaman is scheduled for testing on general mariners' knowledge, first-aid, navigation, and safety at sea at the nearest regional Coast Guard exam facility. Upon successful completion of the required exams, the applicant takes the merchant mariner oath and pays all the required fees (approx. \$350.00) and is issued an Operator of Uninspected Passenger Vessels license (OUPV) (United States

Coast Guard, 2014). This is the first level of captain's license an individual obtains and requires renewal every five years. Captains wishing to upgrade their license for tonnage (size of vessel) or to add endorsements such as tow or radar certifications can only do so at time of renewal (United States Coast Guard, 2014).

However, most types of commercial fishing vessels do not require an individual to hold a captain's license to serve as master or captain of the vessel. This is because commercial fishing vessels are not for hire and do not carry paying passengers. Official Coast Guard licenses and endorsements are only required for those working on large vessels normally over 100 feet in length that are required to conform to the international maritime organizations (IMO) licensing standards for masters and crewmembers. Vessels of this tonnage and crew sizes used in commercial fishing are normally limited to large offshore net fishing vessels, some offshore deep-water crab boats, and processing ships where smaller commercial fishing vessels offload their catches at sea (United States Coast Guard, 2014).

It appears that differences related to prestige and socioeconomic levels exist between commercial fishermen who possess a captain's license and those who do not. While no formal research has been conducted concerning the differences between the fishermen who possess a captain's license and those vessel masters who do not, J. Dzugan (Executive Director AMSEA, personal communication January 22, 2011) provided information regarding formal training and education and captain's license status. Commercial fishing vessel operators, who hold a captain's license, normally receive higher recognition in the commercial fishing fleet and often receive higher pay than captains without a captain's license. This may contribute to prestige and

socioeconomic differences within the commercial fishermen both regionally and nationally.

Commercial fishing safety regulations. In 1985, a group of commercial fishermen, researchers, family members and state and local officials in Alaska decided to address commercial fishing safety and developed the National Standard Curriculum for emergency training. The Alaska Marine Safety Educators Association (AMSEA, 2012) was founded in 1988 with the goal of providing critical safety training to commercial fishermen to reduce fatalities and injuries in commercial fishing. In 1988, the United States Congress passed into law the Commercial Fishing Vessel Safety Act (CFVSA) (Commercial Fishing Vessel Safety Act, 1988). With the signing of the CFVSA, congress mandated that commercial fishermen receive specific safety education aimed at teaching commercial fishermen to survive emergencies of at sea.

The CFVSA directed the Coast Guard to develop and implement regulations to be included in the Code of Federal Regulations (CFR) and later discussed congressional hearings (*Commercial Fishing Industry Vessel Safety*, 1993). The Coast Guard developed the new regulations and included them into the CFR. The CFR section that applies to commercial fishing is commonly referred to as 46 CFR 28. Once the regulations were included in the CFR, the Coast Guard assumed responsibility for enforcement of the regulations. The Coast Guard was further directed to develop an educational program to provide training opportunities for the commercial fishermen (MacDonald & Powers, 1989).

Through a joint effort by AMSEA and the Coast Guard, a course was developed and formally certified by the Coast Guard as the standard course for meeting the

requirements as outlined in 46 CFR 28 for commercial fishing safety education as specified by the U.S. Congress. This program is formally recognized as the Emergency Drill Conductor Course (EDC), or drill class, as it is commonly referred to in the commercial fishing industry. The Coast Guard has the responsibility of ensuring that the level of training the fishermen receive is maintained to ensure that competent instructors are available who meet the requirements for an instructor as directed by 46 CFR 28.275. A brief explanation of the CFR numbering system is included for clarification using the previous mentioned 46 CFR 28.275. The citation 46 CFR refers to 46th title of the Code of Federal Regulations, 28 refers to section 28 within Title 46 and .275 is the subsection of section 28 which contain specific regulations (United States National Archives, 2014).

In 2010, the United States Congress passed the 2010 Commercial Fishing Vessel Safety Reauthorization Act (CFVSRA). The CFVSRA includes enhanced training requirements for commercial fishermen and includes new regulations concerning commercial fishing vessels and crew. For this study, the two primary aspects of the 2010 act are the inclusion of state-registered commercial fishing vessels being required to meet all new and current regulations (currently state-registered commercial fishing vessels are exempt of many of the regulations found in 46 CFR 28) (Commercial Fishing Vessel Safety Act, 1988). The second aspect is the requirement that a certified emergency drill conductor must be physically on board the commercial fishing vessel while commercially operating seaward (out to sea) past the boundary line of three nautical miles as established by the Coast Guard (Coast Guard Authorization Act, 2010

The CFVSRA requirement that state-registered commercial fishing vessels must comply with all safety regulations will add an estimated 80,000+ commercial fishermen to the approximately 60,000 existing commercial fishermen, who currently fall under the regulations, but are not required to attend the Emergency Drill Conductors (EDC) course to meet the regulations (Coast Guard Authorization Act, 2010). While some vessels are exempt from some or all of the current safety regulations (depending on size, registration, number of crewmembers, and fishing areas), it is required that all commercial fishing vessels, which fish out to sea past the three-mile boundary must conduct monthly emergency drills on board the vessel. The emergency drills must be conducted by an EDC and be logged in the ships logbook with the name and certification number of the EDC who conducted the drills. Presently the EDC does not have to be a member of the crew and may conduct drills on board commercial fishing vessels anywhere in the U.S. territorial waters (Commercial Fishing Vessel Safety Act, 1988). This is estimated to end in 2015 when the requirement to have an EDC physically onboard the commercial fishing vessel while operating. Once this requirement is implemented as a regulation, the changes will require an estimated 140,000+ commercial fishermen, or one person per vessel, who will be required to attend a course to become certified as an EDC for their vessel to legally fish (Coast Guard Authorization Act, 2010).

The CVSRA also establishes a five-year re-certification requirement for all Emergency Drill Conductors. This recertification requirement will add another 25,000 commercial fishermen to the 140,000 previously mentioned fishermen who will have to attend EDC courses to become recertified to meet the new regulations (Coast Guard

Authorization Act, 2010). This presents a massive training effort to ensure that an estimated 165,000 commercial fishermen can continue their livelihood.

The additional requirement for the fishermen to attend either an initial or refresher training within a proposed 10-year implementation timeframe of the regulations, indicates that fishermen requiring initial EDC courses will have to be recertified at least once during the initial 10 year training effort to meet the EDC onboard regulation. This means that all fishermen trained in the first five years of the training effort will be added into the ongoing total number of commercial fishermen requiring initial training or recertification.

The CFVSRA, once fully implemented, will have a major impact on both commercial fishing and commercial fishermen. The unintended effect of the CFVSRA is that it requires an estimated 165,000 commercial fishermen to attend EDC courses for initial or recertification training at least once during the proposed 10-year time period (Coast Guard Authorization Act, 2010). This massive training effort falls ultimately to the Marine Safety Instructors (MSI) and will require a large increase in the number of certified MSI available, currently there approximately 60 active MSI nationally. This creates the need for a training effort to also recruit and train additional MSI, in addition to the training of the commercial fishermen. To provide educational opportunities for commercial fishermen on a large-scale training effort will require current MSI to develop new instructional delivery means, teaching methods, and concepts to address the volume and scope of this education/training project (T. Culpeper. USCG Region 7 Commercial fishing vessel safety examiner, personal communication, November 14, 2013).

To design an effective training effort on such a large scale encourages instructors and program developers to use modern educational and instructional methods to develop training programs optimized for commercial fishermen as learners. A knowledge of the commercial fishermen's learning preferences may allow for development of enhanced educational opportunity where information is delivered using instructional methods optimized for the fishermen's preferred means of learning. The knowledge gained regarding the learner preferences of commercial fishermen can be introduced to current MSI to allow for greater understanding of their students as learners. This knowledge could be invaluable if incorporated into the Marine Safety Instructors Training course (MSIT) to enhance potential new instructors knowledge base. The understanding of the fishermen as learners may allow for MSI to better tailor their courses to the learner and may improve commercial fishermen's retention of critical safety training information (J. Dzugan. Executive Director AMSEA, personal communication January 22, 2011).

Commercial fishing safety education. According to the U.S. BLS (2010), commercial fishing is the most dangerous job in the United States. In the U.S., the national fatality rate of commercial fishermen is nearly 200% higher than the fatality rates of all other industries combined (U.S. BLS, 2010). It is this high fatality rate, which creates the critical need for safety education and training for commercial fishermen.

The area of commercial fishing safety education is an area of great concern for coastal communities and countries globally (Binkley, 1991). Currently commercial fishing safety education and training is conducted through a national program approved by the Coast Guard. This program is carried out using a proven curriculum, which

requires a minimum of 10 hours of combined classroom and practicum (Perkins, 1995). The current curriculum for commercial fishing safety education and training was formally established in response to the CFVSA enacted by the U.S. Congress in 1988 (Commercial fishing industry vessel safety 103d Cong. 1, 1993). Additional in-depth discussion of this act is found in the commercial fishing regulation section of this review.

However, it should not be inferred that no safety education and training occurred before 1988. Appave (1989) claims that commercial fishing safety education traced its roots to the mid-17th century with the earliest recorded account of training commercial fishermen for safety in 1668, in what is now the North East Atlantic region of the United States. This training was conducted by a ship owner who had visited a Scandinavian fishing port and saw the fishermen wrap themselves in the nets on cold days to stay warm. Upon his return to the new world, he shared what he had witnessed to the crew of his fishing vessel to wrap themselves in the fishing nets on cold days, thus the first documented exercise in commercial fishing safety occurred.

Commercial fishing safety education and training continues today with public schools in some local fishing communities providing education for the fishermen through their vocational programs or a variety of for and non-profit organizations utilizing an updated version of the approved national standard curriculum. This initial curriculum has been constantly updated since its creation and continues to evolve. Continuous updating is necessary to ensure that the information is both current and relevant and incorporates any new regulatory or technological developments which affect the commercial fishermen.

The marine safety educators. Currently AMSEA is the primary provider of training for Individuals desiring to become Coast Guard accepted Marine Safety Instructors (MSI). J. Dzugan (Executive Director, AMSEA, personal communication January 22, 2011) states that the limited availability of safety education for commercial fishermen in the United States is due to the lack of Coast Guard approved MSI. To become a MSI, an individual must meet the requirements as set forth in 46 CFR 28.275 as acceptance criteria for instructors, the requirements include actual experience as a commercial fishermen combined with experience as an instructor. Once basic regulatory criteria are met, the individual must attend and successfully complete a 5-day 48-hour MSIT course.

Finally, after successful completion of the MSIT, the individual applies to Coast Guard headquarters and, after review by the Coast Guard Marine Safety Office (MSO), will either be accepted or denied. Historically the MSO rejects 68% of individuals who complete the MSIT course. Dzugan believes that this fact, combined with the issue that many instructors are semi-active in offering courses, only further complicates the training effort due to decreased numbers of qualified active instructors. This reduced number of instructors requires the remaining active instructors to be more efficient when providing critical lifesaving training. He states that AMSEA encourages instructors to mold the class to their particular region or fishery to make the course relevant to the commercial fishermen and that it may be beneficial for instructors to understand the commercial fishermen as adult learners.

Adult Education

Adult education traces its roots to ancient times, when only after years of study under a master teacher could learners take their place in society. Many large-scale adult education programs have been undertaken in various countries globally with programs such as the Swedish study circles and the Chautauqua study groups in the United States. Most training programs in modern history have been centered around vocational or subsistence areas to stimulate or enhance production of goods and agricultural staples. Most of the early programs were also meant to educate the masses to create better citizens and to improve social order through the creation of more educated and informed citizens (Knowles, 1984).

Previously, adult education was discussed from the perspectives of adult development, such as Havighurst (1952) and Levinson (1978, 1996), and also from those in the area of adult learning, such as Gardner (1983), Houle (1970), Knowles (1970, 1984), and Tough (1975). Knowles (1970) popularized the term of *Andragogy* (a term coined by Savicevic) and associated it with the fledgling field of adult education. The term Andragogy has since become synonymous within the field of adult education, and is defined as the art and science of helping adults learn. Today scholarly research has been focused on adult education with educators and researchers examining constructs such as social roles (Havighurst, 1952; James, Witte, & Galbraith, 2006), learning orientations (Ginsberg & Opper, 1988; Martinez & Bunderson, 2001) and self-directedness of adult learners (Tough, 1975), adult development (Levinson, 1978, 1996), and a host of other related topics.

Adult educators, such as Tough, whose 1975 research study into the self-directedness of learners provides for a wealth of knowledge and insight into how adults learn on their own. Elias and Merriam (1980) and James et al. (2006) have produced a wealth of knowledge into the areas of adult learners and their respective social roles and how this influences educational efforts. This previous research provides the foundational beginnings for this study since the commercial fishermen are adult learners.

Teacher-centered instruction. The instructional method where the flow of knowledge/information is controlled or led by the instructor is often referred to as Teacher-centered instruction. This is the type of learning experienced by most individuals in their K-12 school learning environments. Some researchers, such as Hirsch (2003), argue that teacher-centered instruction does not allow for the creation of learning events in the classroom. However this opinion is challenged by learning style theorists such as Martinez (1999) and McKeague and Di Vesta (1996) who are of the opinion that only when learners are presented knowledge/information aligning to their individual learning style is a true learning moment created.

According to McKeague and Di Vesta (1996), many learners prefer teacher-centered instruction to other types of instruction, due the familiarity of the instructional method encountered in K-12 years of education. This is the result of many years of learning in a teacher-centered environment throughout their pedagogical education experience. Alquist (1990) states that regardless of the theoretical discussions concerning teacher-centered instruction. He adds that instruction in many subject areas especially in

practical task education is best delivered by an instructor leading the flow of information. This is often needed due to the complexity or vital nature of the subject matter.

Teacher-centered instruction is the norm in many vocational training programs and is especially true in most types of safety education. Teacher-centered instruction is a critical component in commercial fishing safety education, where the instructor must lead the students through multiple skill learning moments involving complex steps and then conduct practicums to ensure confidence and proficiency with the knowledge/skills gained in the classroom setting by the learners (Nelson, 1999).

One example of this is righting a life raft, while a student can be shown how to right a life raft using only a book or video. The learning moment occurs when the teacher, students, and the life raft are in the water, and the teacher demonstrates to students how to correctly right an overturned life raft, and then requires the students to perform the task. This method using demonstration and practice of the skill often results in increased retention of the knowledge and the skill.

Learner-centered instruction. The learner-centered instructional method utilizes various approaches to present knowledge in a manner more ideally suited for the student than the instructor. Using methods that allow for greater flexibility and autonomy of the adult learner may offer increased value to the learner. Learner-centered instruction is considered a primary instructional method used in modern adult education.

Hirsch (2003) suggests that adult learners undergo a change in learning preferences as worldview and knowledge increase. This theory indicates that the adult learner has more knowledge and is capable of determining what is best for the individual. The

underlying assumption is based on perceived value or benefit to the learner. In this method of instruction, the instructor disseminates information and aligns assignments to invoke the learners to take charge of their individual learning efforts.

One means of accomplishing this goal is through the use of a detailed syllabus where every semester assignment is listed. Another popular method of learner-centered instruction is the assigning of research papers in a broad field area. This method enables a learner to choose what topic to research and to decide what is considered valuable in the reading. Encouraging the self-directedness of a person holds the concept of learner interest at its theoretical core.

Transformative education. Is a new instructional method developed with the advent of Internet, which utilizes multiple information sources and instruction delivery techniques in an attempt to provide learners with the option to take control of their learning source. This instructional method is commonly referred to as transformative or blended. This blended or transformative learning is dependent upon technology for distance delivery methods such as online learning. Inherent concerns and issues with the security of the technology have been raised.

Onosko (1991) discussed a comparison of traditional versus transformative education where both staunch proponents and opponents regarding transformative education exist. According to Onosko, arguments exist on both sides of the issues. However, the arguments are centered upon discussion and concerns that are arcane and outdated and are mostly due to the lack of knowledge regarding transformative educational methods and benefits.

Transformative education incorporates both teacher-centered and learner-centered approaches combined with self-directed education on the learner's behalf through conventional or internet-based means of instruction. This type of information dissemination is rapidly growing due to the technology available to both the learner and instructors.

According to Tasir, Noor, Harun, and Ismail (2008), transformative learning is fast becoming a preferred means of instructional delivery due to the combining of teacher-centered and learner-centered methods in conjunction with the use of technology to present information through new avenues. Both learners and educators view this blended learning favorably as it allows for both the self-discovery by the learner and the opportunity for the instructor to guide the learner while providing interesting and valuable presentations and instruction through the use of the internet.

Martinez (2002) argues that the views held by students and teachers of Internet-based transformative education is unclear. The sudden growth of collaborative communication using the internet suggests there is a need to develop collaborative educational learning tools for use by today's educators. McKeague and Di Vesta (1996) suggest that educational administrators and faculty members need guidance to ensure that formats for collaborative education enhance the student learning environment in both pedagogical and andragogical applications.

Harasim (1990) claims that online environments are particularly appropriate for all learners because they emphasize group interaction. As technology use in education increases, decisions regarding instructional methods to effectively connect learners are becoming increasingly critical and complex. The lack of guidance regarding integration

of collaborative and global communication into one's classroom or training setting often leaves instructors with growing confusion (Brown, Collins, & Duguid, 1989). Due to the growing preference of adult learners towards non-traditional instructional methods, the traditional teacher-centered model in which knowledge is transmitted from teacher to learner is rapidly being replaced by alternative models of instruction (e.g., learner-centered, self-directed, and hybrid). In learner oriented instruction, the emphasis is on guiding and supporting students as they learn (Cobb, 1994).

The need to anchor learning in real-world contexts that give learning meaning and purpose is recognized as being beneficial to the learner (Duffy & Cunningham, 1996). The blending of these technological capabilities with current knowledge regarding adult learning concepts, combined with an increased understanding of how technology is changing education. This has created the need for additional research on transformative instructional techniques such as video conferencing, information sharing, and other forms of collaboration. The internet allows for the exchange of information around the globe, where a multitude of instructional strategies are being developed that include the ability to communicate in real time around the globe, which presents opportunities for redefining learning environments (Koschmann, Myers, Feltovich, & Barrows, 1994).

Harasim (1990) claims that advances in learning technologies were evident in journal articles, conferences, workshops, and many professional organizations. According to Martinez and Bunderson (2001), today's technology allows for the connection of students and instructors in real-time environments. They also found that all the new technologies for instant collaboration by faculty members regardless of

subject or institution provides the opportunity to interact with peers and professionals around the world to develop curriculum and instructional methods beneficial to the learner, academia, and workplace interests. King (2005) believes that the use of technology to create significant learning opportunities is of great benefit to both educators and students.

Nelson (1999) discussed the major issues for untrained educators and administrators on how to develop an educational framework that incorporates all of the available tools and knowledge. The challenge is to create learning environments where both instructor and learner are comfortable with technology while meeting the learning requirements for accredited programs and courses. This framework development must build upon the abilities of students currently entering higher education or beginning careers in corporations. He stated that building upon this foundation would require using technology and advances in instructional methods available now in K-12 education to ensure optimized learning environments for future students. He continues that care must be taken to ensure that the instructor and administration are also able to operate proficiently in the transformative environment.

Modern leaders in the field of transformative education such as King and Lawler (2003) have conducted research into the importance of utilizing technology to educate adults. They claim that the use of technology, especially the Internet is an increasingly popular method to facilitate the education of adults. King (2014) stresses the importance of adult educators needing to instill the use of technology into their curricula. She concludes that educators who embrace the use of technology available to them often develop new educational opportunities to simulate exciting learning experiences.

Learner Preferences

Learning preferences, also known as learning styles or learner orientations, are the individual's preferred means of learning. Individuals have distinct learning preferences or ways in which they learn best, these include the areas of perceptual/physiological, cognitive, and affective/personality traits of the learner (James & Blank, 1993; James & Maher, 2004; Keefe, 1979).

Learner orientations. No formal research into learning orientations of commercial fishermen has been found. However, it may be important to understand that the area of learning orientations has a wealth of knowledge gained over many decades of research on why and how individuals learn. The two broad learning orientations are pedagogy (the study of the learner as a child) and andragogy (the study of the adult as a learner). However, learner orientations are comprised of many complex factors such as the learner's preferred method of learning, preferred method of instruction, the self-directedness of the learner, and the individual learner preferred style of learning such as visual, aural, or kinesthetic instructional methods.

Cattell (1965) believes that an individual's perception of value or benefit to the individual, along with the relevancy of the instructional material related to the objective, and a myriad of social and personal factors can shape each individual's learning orientation. Learning orientations of each learner must be taken into account in preparing the learning activities. Ginsberg and Opper (1988), in their examination of Piaget's theory of intellectual development, discuss the differences of learners including learning styles, learning orientations, learning rates, cognitive styles, multiple intelligences, talents, and many more.

Other researchers, such as Weber, Martin, and Cayanus (2005), add that learning is a constructive process and that students learn the most when learners understand the relevance and meaningfulness of what they are learning. The study also concluded that when learners are able to actively explore their own concepts along with provided fundamental knowledge, they more efficiently connect what they learned to their prior knowledge and experience.

The Learning Orientation Model (LOM) introduced by Martinez and Bunderson, (2001) does not focus primarily on cognitive constructs, but is more concerned with conative, affective, and social aspects of how individuals use and manage their own learning. According to Unfred (2002), the intent of this theory is to focus on emotions and intentions of an individual regarding why, when, and how learning goals are organized, processed, and achieved. In nonprofessional terms, learning orientations describe individual's preferred approach to managing and achieving their learning, intentionally and differently from others. According to Martinez (1999), learning orientations focus on the learner's learning experiences, personal choices about learning, and learning style. This whole person approach is based on learning and performance outcome (Martinez, 1999).

Based on the research conducted by Martinez (2001), learning orientation is rational and useful when using a holistic view of learning. Increased knowledge of the student's learning orientation could help to identify factors that may influence the learner's abilities. Her research identified the usefulness of learning orientations for educators as a tool to analyze individual students about which methods may be most effective for the

individual learner. This may be used to enhance future curriculum design to better match the learners' preferences.

An important result of Martinez's research lay in the discovery that matching learning orientations and learning environment resulted in a 99% satisfaction score and a 95% learning efficacy score. This evidence suggests that the knowledge of learning orientations is critical in designing not only effective instructional methods, but also in creating an ideal learning environment. Tasir et al. (2008) found that learning orientations are considered useful concepts for online students when considering the impact of emotions, intentions, and efforts needed to accomplish learning and success, and the importance of social factors related to learning.

The Learning Orientation Questionnaire (LOQ), constructed by Martinez in 1999, created four profiles of students based on the learning orientations model, she describes these as the Transforming Learner, Performing Learner, Conforming Learner, and Resistant Learner. According to Bentley (2001), the Learning Orientations Questionnaire may assist in developing new means to assess and explore the differences in individual learning.

Learning style. According to Liu (2007), learning style (also known as cognitive learning style) has many theoretical dimensions such as those described by the Felder-Silverman Learning Style Theory, Witkins Field Independence or Dependence, Honey and Mumford Learning Style, Kolb's Learning Style Model, Myers-Brigs Type Indicator, and so on. Keefe (1979) defined learning style as cognitive, affective, and physiological behaviors that indicate how learners interact with and respond to learning environment. Contemporary researchers such as Martinez and Bunderson (2001) and Tasir et al.

(2008) have concluded that emotions and learner intentions may affect students' learning. Intentional learning theory suggests that how an individual learns, the effect of the learning environment, participation in learning activities, and the rationalization of new knowledge may be affected by the learner's attitudes and goals about learning.

Learning preferences and impact on learning. Much research has been conducted into learning preferences and their impact on learning. According to a 2009 study by Thompson-Schill, Kraemer, and Rosenberg, the existence of learning preferences has been verified. While learning preferences are widely recognized as a concept, there is still confusion on how they may be measured or assessed. According to Coffield, Moseley, Hall, and Ecclestone (2004), it may be more beneficial to match presentation styles to corresponding learning methods. The Coffield et al. report contains the strongest argument to support the existence of learning preferences and is, in fact, a necessary concept to be considered.

When the learning preferences of the individual learner are examined, Coffield et al. claim the learning preferences become apparent and are important to the success of the learner. Coffield et al. state that while learning preferences may not be highly important when designing programs, learning preferences are critically important for teachers or trainers.

Merrill (2000) believed learning preferences played a strong role in learning, and that they should be used as a secondary educational tool once program design has determined exactly what is to be taught. It is up to the teachers, who see each learner's individual learning preferences, to tailor their presentations content to best align the content to the learner's individual preferences. Merrill adds that most students are

unaware of their learning preferences and may not explore new methods of learning. The awareness of the individual's learning preference may increase the student's self-awareness and prompt the individual to explore their new learning preferences. He adds that learning preferences increase the learners' metacognition of their learning and gain an increased awareness of how others learn.

Summary

This chapter reviewed the available literature and legal standards related to commercial fishing. Literature exists concerning many aspects of commercial fishing, commercial fishing safety education, and the marine safety educators; however, no research was discovered which specifically addressed commercial fishermen as learners. One section discussed adult education as a foundation for this research since commercial fishermen are adult learners. The review of adult education included some historical and modern approaches and foundational theories of adult education. Finally, the chapter examined learning preferences of individuals and explored best practices and theories related to various educational approaches used to identify, assess, and implement instructional methods to best align with learner's identified preferences.

Chapter 3

Methods

The purpose of this study was to identify the learning preferences of commercial fishermen. Chapter 3 includes the research design, population and sample, instrumentation, data collection procedures, and data analysis.

Research Design

This exploratory quantitative study investigated the learning preferences of commercial fishermen. The study utilized data gathered from a self-report instrument administered to a sample of fishermen in eight commercial fishing regions detailed later in this chapter. The population was estimated to be approximately 280,000 commercial fishermen.

This study was designed to collect data to answer the following research questions:

1. What are the learning preferences of commercial fishermen?
2. Are there differences in the learning preferences of commercial fishermen across the eight geographical regions of the study?
3. Are there differences in the learning preferences of commercial fishermen based on the demographical variables?

The demographic variables for this study included:

1. Age,
2. Education level,
3. Captain's license status, and
4. Method of fishing.

Population and Sample

The target population was comprised of approximately 280,000 commercial fishermen in the eight U.S. geographical regions. Samples were collected from each of the eight regions where commercial fishing occurs in the United States. The eight geographical regions included the Northeast Atlantic, Mid-Atlantic, Southeast Atlantic, Great Lakes, Gulf of Mexico, Southern Pacific, Pacific Northwest, and Alaska. Each region is described in additional detail below.

Northeast Atlantic. This region included the coastal areas found from Cape May, NJ extending northward to the Canadian border. This region has historically utilized long-line methods of fishing (see Appendix A, Figure A9) to catch swordfish and tuna, with most vessels traveling 20 to 300 miles from land to target these species. The other primary fishery of this region was trap fishing for lobster and crab, which takes place 3-15 miles from shore (see Appendix A, Figures A7 & A8). Most commercial fishermen in the Northeast Atlantic region are divided between the two primary fisheries of long-line and trap fishing methods.

Mid-Atlantic. This region included the coastal waters from Cape May, New Jersey extending southward to the North Carolina-South Carolina border. This region is home to a myriad of different fisheries requiring a variety of fishing methods, including long-line, bandit, conventional rod and reel, purse seine, and trap.

The two major fisheries use bandit and long-line methods of fishing for deep-water offshore fish such as grouper and snapper normally found 50 to 200 miles offshore (see Appendix A, Figures A2 & A9). The other primary fishery of the Mid-Atlantic region is the trawl net fishery targeting a variety of fish, shellfish, and shrimp, which are normally

caught on the continental shelf 3-30 miles from land (see Appendix A, Figures A12 & A13). The Mid-Atlantic is also home to a large inshore fishery, which exists from three nautical miles offshore inland to the various bays and tidal estuaries. This fishery utilizes both net and trap methods of fishing with crab, shellfish, and shrimp being the most frequently targeted species.

Southeast Atlantic. This region included the coastal areas from the North Carolina-South Carolina border extending southward to Key West, Florida. This area is home to the largest number of both commercial fishermen and the types of fishing methods utilized. The commercial fishermen in this region are involved in many different and often multiple fisheries, utilizing various types of fishing methods. Because of the overlapping seasons, the fishermen are often targeting multiple species simultaneously. For example, trap fishermen often set their traps and then target other species during the waiting (soak) period until they return to check their traps in 1-5 days (see Appendix A, Figures A7 & A8).

The fishery of this region is differentiated by the targeted species, location, and distance from land in which the fishery exists. Offshore past three nautical miles from shore, multiple fisheries occur 60-120 miles from land. These are primarily large boat fisheries with vessel sizes that range from 65 to 250 feet in length; these vessels often stay at sea for 15-90 days per trip. These vessels use both bandit and long-line methods of fishing for deep-water species such as large tuna and swordfish (see Appendix A, Figures A2 & A9). A large vessel net fishery also exists in this region typically occurring in the offshore areas 40 to 300 miles from shore. This fishery utilizes

large purse seine nets to target schools of offshore fish such as tuna, mahi-mahi, and mackerel (see Appendix A, Figure A14).

Inshore, several net fisheries exist that use a multitude of net configurations to target species such as scallop, shrimp, flounder, and mullet (see Appendix A, Figures A12 & A13). A separate small boat or day-boat fishery exists which uses vessels ranging from 25 to 65 feet in length that utilize conventional rod-and-reel methods to fish for species such as wahoo, king mackerel, tuna, grouper, and snapper (see Appendix A, Figure A3). There is also a prominent near-shore trap fishery with varying vessel sizes conducted from shore to seven miles out, which targets several types of crab, blackfish, and lobster.

Gulf of Mexico. This region included coastal areas beginning in Key West, Florida extending northward and westward to the United States-Mexico border. The fisheries in this region are divided between two primary methods: long lining for deep-water species in the 100 to 350 miles offshore range and inshore fisheries which are unique from other regions, due to the distances from shore in which the fisheries exist (see Appendix A, Figure A9).

The use of nets for shrimp is normally conducted from 1 to 110 miles from land because of the low decline of the continental shelf that results in the water being shallow for long distances from land, with water depths 75 miles offshore often not exceeding 80 feet in many areas of the region (see Appendix A, Figure A13). An inland trawl net fishery exists that uses nets to target scallop, flounder, and bait shrimp that are found in tidal bays and estuaries (see Appendix A, Figures A12 & A13). This region also has an inshore trap fishery to target crab and lobster (see Appendix A, Figures A7

& A8). In the Gulf of Mexico region, lobster and crab fishermen represent the largest percentage of commercial fishermen. Shrimp fishermen account for the second largest number of active commercial fishermen.

Great Lakes. This region was defined as the United States coastal areas of the Great Lakes. The region is a cold-water fishery, which primarily targets various species of salmon and trout. Trawl net fishing is the conventional method of commercial fishing in the Great Lakes region (see Appendix A, Figure A12). This fishery is primarily a deep-water fishery targeting schools of fish in open waters often exceeding 100 feet in depth and often occurring more than 10 miles offshore.

The commercial fishermen using conventional rod-and-reel and fish trapping methods represent a very small percentage of the commercial fisherman in this region (see Appendix A, Figures A3 & A5). Net fishing in this region is normally conducted on small to medium size vessels in the 30-65 foot ranges, typically with a crew of four or less in contrast to the rod and reel and fish trapping where vessel sizes range from 15 to 30 feet in length with typical crew of two.

Southern Pacific. This region comprised of the Pacific coastal areas of California beginning at the United States-Mexico border extending northward to the California-Oregon state line. This region is best known for its active tuna and albacore fishing industries; however, there are viable fisheries for over 300 different species that are sought commercially in the state.

This region's commercial fishermen utilize the largest variety of fishing methods with long-line, trolling, rod and reel, and harpooning for pelagic species (such as tuna and swordfish). An offshore net fishery exists using varying net fishing methods depending

on species targeted ranging from salmon and steelhead trout in the northern waters to albacore and tuna in the southern areas of this region.

A net fishery also exists which targets smaller inshore species. This region is known for a variety of trap fisheries ranging from crab, cod, and halibut in the north to snapper and rock bass in the south (see Appendix A, Figures A6 & A7). A unique aspect of this region is the commercial fishing conducted by scuba diving for various sponges and shellfish.

Pacific Northwest. This region was defined as the Pacific coastal waters beginning at the California-Oregon state line extending northward to the United States-Canadian border. This region is primarily a cold-water fishery, with the majority of these fishermen involved in the salmon and steelhead trout net fisheries (see Appendix A, Figures A4, A6, & A12). The remainder of this region's fishermen are fairly equally distributed in both the offshore and inshore net fisheries, targeting crab, cod, halibut, and other bottom-dwelling fish (see Appendix A, Figure A12). Outside of the primary salmon fishery, the region's fishery targets large halibut using both rod-and-reel and trawl net methods (see Appendix A, Figures A3 & A12). This region also provides a viable shellfish industry in some areas of the region. A unique aspect of this region is a developing fishing industry harvesting various kelps and seaweed, which are considered seafood products for human consumption.

Alaska. This region represented the coastal areas of the state of Alaska, which had boundaries beginning in the south at the United States-Canadian border extending northward and westward to include all the United States territorial waters bordering on the Alaska mainland and associated islands within the state of Alaska. This region is

known as a cold-water fishery and fishermen utilize all of the methods of fishing discussed in this study.

The primary commercial fishery is the inshore purse seine net fishery for species such as herring and salmon. This is typically a small boat fishery with boat sizes ranging from 25-55 feet in length (see Appendix A, Figure A14). However, there are also larger vessels in the 55-95 foot range that uses trawl nets or purse seine nets to target salmon (see Appendix A, Figures A12 & A14). While the net fishery represents the largest segment of Alaskan commercial fishing, a thriving inshore trap fishery exists for species such as cod and various crab species. This is a small boat fishery with vessel sizes ranging from 18-65 feet in length (see Appendix A, Figure A6). This region has a unique fishery found only in the western Alaska region of the Bering Sea and involves deep-water trap fishing for various offshore migrating crab species (see Appendix A, Figure A6). This is a large vessel fishery with average boat lengths being in excess of 80 feet. The trap fishing for crab in the Bering Sea is widely accepted as being the most dangerous fishery on the planet and historically this fishery has resulted in countless fatalities of commercial fishermen (U.S. BLS, 2010).

Sample selection. This research collected a representative sample from each of the eight regions identified in the study. Sample size was calculated using a confidence level of 95% with a confidence interval of $\pm 5\%$ yielding a sample size of 384, which is rounded up to obtain an N of 400 participants to provide for equal numbers of samples for each region. The study included a minimum N of 400 @ $\alpha = .05$ with a power of .80. The participants were selected from the eight individual regions as a stratified sample

with a minimum n of 50 participants from each of the eight geographical regions of the study. Inclusion into the study was by the following criteria:

1. All participants had to be employed in commercial fishing at the time of data collection.
2. All participants had to possess sufficient English reading skills to complete the survey instrument.

This study sampled commercial fishermen from each of the eight described regions and included fishermen employed in the various methods of fishing. Sampling in this manner provided representative data for the commercial fishermen in each region. This stratified sampling method allowed for the collection of data sufficient for statistical analysis to make generalizations to the larger national population of commercial fishermen.

Instrumentation

This study utilized a adapted self-report instrument designed by Felder and Solomon (n.d) to collect data to answer the research questions. A demographic survey and an adapted version of the *Index of Learning Styles Instrument* (ILS) were combined to form the 49-question instrument known as the *Commercial Fishing Worker Survey* (CFWS).

Demographic survey. This survey was designed to collect information on individual participants such as age, education level, professional or formal education, and other general information. See Appendix C for the demographic survey. This survey provided data sufficient to address specific parts of research questions 2 and 3 related to the following areas within the questions. The demographic variables included are:

1. Age,
2. Education level,

3. Captain's license status, and
4. Method of fishing.

Index of Learning Styles. This instrument was developed by Felder and Solomon (n.d), to identify learner preferences on four dimensions: active/reflective, sensing/intuitive, visual/verbal, and sequential/global.

The dimensions used in the ILS were adapted from a learning model developed Felder and Solomon (n.d.) to over 200 adult students and the resulting data underwent statistical factor analysis to determine loadings of the individual items. One item failed to load and that item was replaced, resulting in the current 44-item instrument in use today.

The ILS was originally developed for learners of adult age and all validation data represent college age or older adults (Felder & Silverman, 1988). The instrument was made publically available on the Internet in 1996 with over a million visitors to the instrument site every year. The instrument is available in Spanish, Portuguese, Italian, German, and other languages (Felder & Solomon, n.d.).

For the purpose of this study, the ILS language needed to be modified to make it more aligned with the reading levels of participants. This was necessary to ensure that participants of all reading levels could participate in the study. During the initial field test, it was discovered that the commercial fishermen had difficulty understanding the verbiage of some of the items. Additional detail of the process is provided in the field test section under data collection. The simplified version, which was used in this research, is found in Appendix B.

Validity. Validity is a measure, which refers to the degree of accuracy that an instrument measures ensuring that the instrument measures what it is designed to

measure). There are different types of validity, however discussion will be limited to the types of validity discussed relevant to the ILS. The first type of validity discussed in this study is construct validity. Zywno (2003) provided that construct validity refers to the degree in which items in an instrument are actually able to distinguish between groups it was designed to distinguish theoretically and groups it actually measures.

Zywno states that the purpose of establishing construct validity is to ensure the trustworthiness of the evidence by comparing the evidence and fundamental basis of the evidence with the extent to which it supports the trustworthiness of the evidence. Zywno explains that construct validity and discriminate validity are subtypes of construct validity and lend support to construct validity when present. Campell and Fiske (1959) developed the Multitrait-Multi-method Matrix to assess the self measures and construct validity within studies. They clarify that convergent validity refers to the degree to which multiple measures of theoretical constructs are actually related and that convergent validity is normally estimated using correlation coefficients with high correlations of data between similar constructs across multiple tests that offer evidence of convergent validity. They explain that discriminate validity refers to the abilities to which two or more dissimilar constructs are easily differentiated. To establish construct validity convergent and discriminate validity both must be present.

The *Index of Learning Styles* instrument was the focus of two separate studies, which determine the independence, reliability, and validity of the four-paired dimensional scales. The discussion began with the first study conducted to evaluate the validity of the instrument. Van Zwanenburg, Wilkinson, and Anderson (2000) administered the ILS to over 100 students in 1 academic discipline and over 100

students from another academic discipline. ANOVA analysis of their data found statistically significant differences between the two populations in relation to the mean scores on the active-reflective and sequential-global scales at the .05 level and found further differences between the visual-verbal scale at the .001 level and offered this as evidence of discriminate validity.

Zywno (2003) claims that the ILS exhibited discriminate validity, as significant differences in scores among populations with different characteristics exist. Her study was administered the ILS to students and faculty at Ryerson University and found statistically significant differences between the two populations in the mean scores provided in Table 3 below.

Table 3

Means, Standard Deviations, and ANOVA Results for Comparisons between Students and Professors in ILS Scores

Population	<i>n</i>	Active Score		Sensing Score		Visual Score		Sequential Score	
		\bar{X}	<i>SD</i>	\bar{X}	<i>SD</i>	\bar{X}	<i>SD</i>	\bar{X}	<i>SD</i>
Students	338	6.03	2.38	6.46	2.55	8.09	2.11	5.95	2.11
Professors	68	4.88	2.15	4.75	2.88	8.01	2.15	4.99	2.22
ANOVA Statistics		<i>F</i> =13.603 <i>df</i> = 1.404 <i>p</i> = 0.000 ***		<i>F</i> =24.547 <i>df</i> = 1.404 <i>p</i> = 0.000***		<i>F</i> = 0.064 <i>df</i> =1.404 <i>p</i> = 0.801		<i>F</i> =11.540 <i>df</i> = 1.404 <i>p</i> = 0.001**	

Note. Zywno, M. (2003). A contribution to validation of score meaning for Felder-Soloman's Index of Learning Styles.

** Statistically significant @ 0.01 level, 2 tailed, *** Statistically significant at 0.001 level, 2 tailed.

Zywno adds there is support for convergent validity due to the dimensional scale scores showing that the adult engineering students in different locations and times share many aspects of the model. See Table 4 for the frequencies of the Felder learning styles among engineering students. These results show percentages of participant preferences based on the four-paired dimensions of the ILS.

Table 4

Frequencies of Felder Learning Styles Among Engineering Students

Study	<i>n</i>	Active %	Sensing %	Visual %	Sequential %
Univ. of Western Ontario, Canada	858	69	59	80	67
Univ. of Michigan, MI	143	67	57	69	71
Tulane University, AL	255	60	58	85	50
Univ. of Technology, Jamaica	33	55	60	70	55
Univ of San Paulo, Brazil	351	60	74	79	50
Newcastle, UK	135	Yes*	Yes*	Yes*	Yes*
Ryerson University	338	61	65	88	63

Note. *Only mean score data were provided instead of study population percentage distributions. Zywno, M. (2003). A contribution to validation of score meaning for Felder-Soloman's *Index of Learning Styles*.

Zywno explains that construct validity or scores over time with different samples and populations are used when determining construct validation of an instrument. She presents statistical evidence as shown in Table 5 referring to the analysis of the four

paired dimensional scores collected using consecutive cohorts that utilized learners enrolled in a specific class during the study. The ANOVA statistics reported no significant differences between the means of the eight dimensional scales, this finding supports construct validity of the instrument. Zywno's study contributed to the ongoing validation of the ILS and she concluded that validation of the ILS should rely on construct validity. She explains that the instrument does exhibit both convergent and discriminate validity and exhibits construct validity due to consistency over time and population and that the ILS is a suitable instrument in its psychometric properties to assess the learning preferences of adult students.

Table 5

Means, Standard Deviations, and ANOVA Results for Time Comparison in ILS (Different Cohorts of Students) 2000-2002

Year	Sample <i>n</i>	Active Score		Sensing Score		Visual Score		Seq. Score	
		\bar{X}	<i>SD</i>	\bar{X}	<i>SD</i>	\bar{X}	<i>SD</i>	\bar{X}	<i>SD</i>
2000	85	6.05	2.33	6.74	2.52	8.01	2.28	6.40	2.14
2001	121	6.00	2.48	6.50	2.60	8.21	2.02	5.71	2.04
2002	132	6.05	2.33	6.26	2.51	8.02	2.09	5.87	2.13
Total	338	6.03	2.38	6.46	2.55	8.09	2.11	5.95	2.11
ANOVA Comparison Values		<i>F</i> = 0.024 <i>df</i> = 2.335 <i>p</i> = 0.976		<i>F</i> = 0.947 <i>df</i> = 2.335 <i>p</i> = .389		<i>F</i> = 0.308 <i>df</i> = 2.335 <i>p</i> = 0.735		<i>F</i> = 2.828 <i>df</i> = 2.335 <i>p</i> = 0.061	

Note: Zywno, M. (2003). A contribution to validation of score meaning for Felder-Soloman's Index of Learning Styles.

Reliability. All instruments used for credible research must be reliable, they must assess the measure consistently across time. Reliability may take the form of test-retest that compares measures from one time period to another and through internal consistent reliability using Cronbach's Alpha. Cronbach's alpha is a coefficient that determines how well a scale measures a single underlying construct. The higher the Cronbach's alpha score, the more reliable the scale was thought to be. Raykov (2001) discovered many weaknesses with Cronbach alpha as the sole measure of reliability. He claimed that a primary problem existed with the alpha coefficient in that it is obtained under an assumption of parallelism, which assumes all factors, loadings, and variances are equal. Another primary weakness is the underestimation of reliability. While modern researchers consider composite reliability to be a better indicator of reliability, the ILS has been primarily validated using the Cronbach alpha calculations for reliability.

Cronbach (1951) wrote that while the commonly accepted reliability for studies should be a Cronbach's alpha score of $\alpha = 0.70$ or higher; he cautioned that this was based on many factors of the study. Others such as Nunnally (1978) concluded that Cronbach's alpha scores of $\alpha = 0.50$ are acceptable for most research. Gregory (2000) believed that alpha values should approach .60, but he added that item inter-homogeneity coefficients should fall in the .3 to .7 ranges and that an alpha coefficient above .4 should be considered as acceptable for research as long as there was other evidence of validity and reliability within the instrument. High alpha coefficients can offer evidence that the questions are redundant and lack breadth. George and Mallery (2003) stated that Cronbach alpha values between .5 and .6 are acceptable for research. The reliability scores of four studies (Van Zwanenburg et al., 2000; Zywno,

2003; Litzinger, Lee, Wise, & Felder, 2005; Felder & Spurlin, 2005) concluded that the ILS demonstrated a high level of internal consistency and reliability as measured by Cronbach's alpha with averaged values above the suggested minimum value of $\alpha = .50$.

Van Zwanenburg et al. (2000) examined the reliability of the ILS and reported Cronbach's alpha values in the $\alpha = 0.41$ to 0.65 range. Zywno (2003) concludes that test-retest analysis of the ILS suggested a strong to moderate reliability of all scales and reported Cronbach's alpha values in the $\alpha = 0.68$ to 0.75 range for the eight dimensional scales. See Table 6 for Zywno's Correlations of test-retest analysis.

Table 6

Pearson Correlations of Test-Retest Scores for the ILS

Active Scores	Sensing Scores	Visual Scores	Sequential Scores
0.683**	0.678**	0.511**	0.507**

Note. $N=124$, ** Statistically significant at the 0.001 levels, 2 tailed. Zywno, M. (2003). A contribution to validation of score meaning for Felder-Soloman's Index of Learning Styles.

In an effort to further test the internal consistency of the ILS, Zywno performed a paired samples test to examine the test-retest data, which had been obtained from the four previous studies concerning the reliability of the ILS and reported the results of her statistical analysis. Tables 7 and 8 present the output from her statistical analysis of the results related to the paired sample testing that was conducted by Zywno.

Table 7

Paired Samples Statistics of Test-Retest Scores for the ILS

Pair #	Pairs	M	SD	S E M
1	Active score 1	5.99	2.40	.22
	Active score 2	5.73	2.37	.21
2	Sensing score 1	6.68	2.66	.24
	Sensing score 2	6.50	2.62	.24
3	Visual score 1	8.14	2.11	.19
	Visual score 2	8.51	2.10	.19
4	Seq score 1	6.00	2.07	.19
	Seq score 2	5.62	2.26	.20

Note: $N=124$. Zywno, M. (2003). A contribution to validation of score meaning for Felder-Soloman's Index of Learning Styles.

Table 8

Paired Samples Test of the Dimensional Pairs of the ILS

	Test-retest of dimensional pairs	Mean	SD	SD error	95% CI		<i>t</i>	<i>df</i>	<i>p</i> 2 tail
					Lower	Upper			
1	Active score 1	.26	1.9	.17	-7.9 ⁻⁰²	.60	1.5	123	.133
	Active score 2								
2	Sensing score 1	8.06 ⁰²	2.1	.19	-.30	.46	423.0	123	.673
	Sensing score 2								
3	Visual score 1	-.37	2.0	.19	-.74	-9.5 ⁻⁰⁴	-1.9	123	.049
	Visual score 2								
4	Sequential score 1	.38	2.1	.19	-4.0 ⁻⁰³	.76	1.9	123	.052
	Sequential score 2								

Note. Zywno, M. (2003). A contribution to validation of score meaning for Felder-Soloman's *Index of Learning Styles*.

A factorial analysis was conducted using Kaiser's criteria to extract 14 factors accounting for 54.1% of the variance. See Figure 2 for a scree plot of the factorial

analysis results. Zywno continued to provide discussion of internal reliability as related to Cronbach alpha values. Factorial analysis to obtain Cronbach alpha values was performed using the 557 ILS questionnaires provided by the study participants.

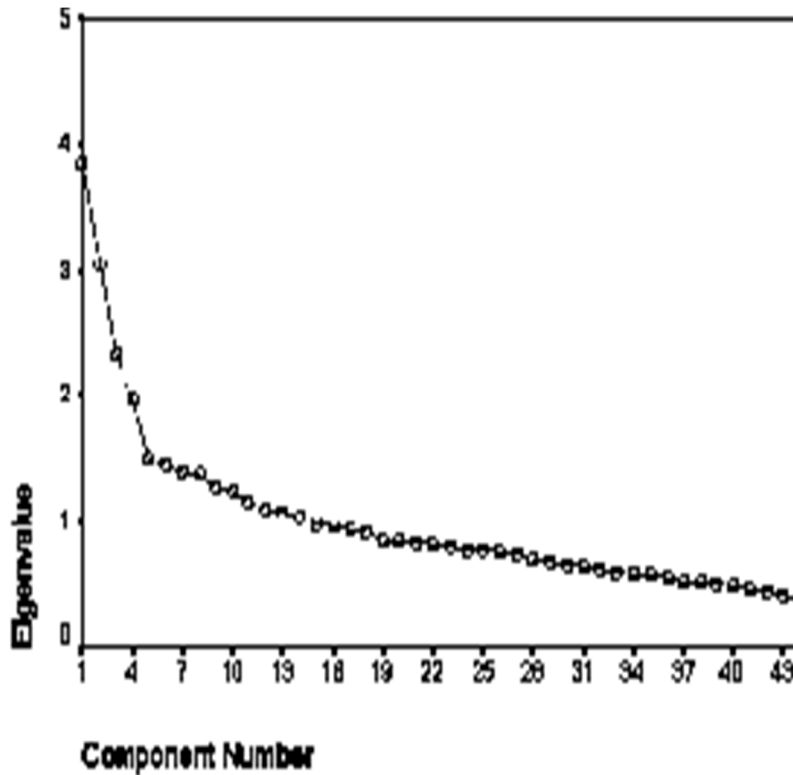


Figure 2. Scree plot for factor analysis on ILS scores (N=551) by Zywno (2003). A contribution to validation of score meaning for Felder-Soloman's Index of Learning Styles.

Questionnaires with missing items were excluded from the analysis that accounts for the varying case numbers. She concluded that the ILS internal reliability scale ranges from 0.53 to 0.70. See Table 9 for Zywno's analysis of internal reliability, provided by the previous studies of the ILS regarding reliability.

Zywno explains that the Cronbach alpha results of her analysis were compared with the results offered by the other validation studies test-retest. See Table 10 for the

internal consistency reliability comparisons of previous ILS reliability studies. She reports that the results were virtually identical with slight differences due to a minor reduction of statistical power.

Table 9

Internal Consistency Reliability Comparison of the Paired Dimensional Scales

Dimensions of the ILS	Cases <i>n</i>	Scale Mean	Scale Variance	Scale SD	Average IIC*	Average ITC*	SD α
Active-Reflective	540	5.7889	5.6177	2.3702	0.1179	0.264	0.595
Sensing-Intuitive	539	6.2430	7.0245	2.6504	0.1730	0.349	0.697
Visual-Verbal	544	8.1801	4.4537	2.1104	0.1354	0.289	0.633
Sequential-Global	532	5.7726	4.7900	2.1886	0.0927	0.217	0.530

Note. Each dimension contained 11 items. *IIC=inter-item correlations, ITC=inter-total correlations. Zywno, M. (2003). A contribution to validation of score meaning for Felder-Soloman's *Index of Learning Styles*.

A subsequent study by Litzinger et al. (2005) found Cronbach's alpha values to be in the $\alpha = 0.54$ to 0.72 range and reported that long-term reliability appeared to be consistent. In an unpublished study by Felder and Spurlin (2005), Cronbach's alpha values ranged from $\alpha = 0.55$ to 0.76 range. Cronbach's alpha scores across the four studies regarding consistency and internal reliability of the instrument were considered acceptable for the purpose of this study.

Table 10

Internal Consistency Reliability Comparisons of Previous ILS Reliability Studies

Study	<i>n</i>	Active Scale α	Sensing Scale α	Visual Scale α	Sequential Scale α
Newcastle, UK Van Zwanenburg et al.	279	0.51	0.65	0.56	0.41
Tulane University, AL Livesay et al.	255	0.56	0.72	0.60	0.54
NC State University, NC Felder & Spurlin	584	0.70	0.76	0.69	0.55
Ryerson University Zywno	557	0.60	0.70	0.63	0.53
Ryerson University* Zywno	406	0.60	0.69	0.61	0.50

Note. *Test-Retest data and 1999 sample excluded. Zywno, M. (2003). A contribution to validation of score meaning for Felder-Soloman's *Index of Learning Styles*.

Data Collection

Field test. A study was used to determine the clarity and ease of understanding of the survey terms. The Commercial Fishing Worker Survey instrument in its entirety was given to 20 commercial fishermen who had agreed to voluntarily participate in the pilot study. The survey was administered by the researcher at an Emergency Drill Conductor class (EDC) in Steinhatchee, Florida. All 20 participants were asked if there were any parts of the instrument which they did not understand related to the clarity of the terminology. All 20 participants reported difficulties in the terminology used in the instrument.

As a result of the difficulties identified by the fishermen, Felder, who created the ILS Instrument, was contacted. Potential verbiage changes were discussed with Felder to

be more appropriate to the vocabulary of the fishermen, while maintaining the context of the instrument questions. After multiple correspondences, a simplified version of the ILS was created which retained the original questions context, but used words that were easier for the fishermen to understand. See Appendix F for the correspondence and approval of the simplified version of the ILS by Felder.

A second field test was performed at three different EDC classes on the Outer Banks of North Carolina. This retest of the survey was designed to determine if the commercial fishermen would understand the changed verbiage of the questions in the ILS. Twenty-eight commercial fishermen from three different locations participated in the second field test of the ILS. All 28 commercial fishermen reported that the wording of the questions was simple and straightforward. When asked as a group if they understood what each question asked, all responded that they understood the questions, but were unsure what the questions had to do with commercial fishing. It was explained that the questions were designed to elicit information about them as learners.

To further ensure that the commercial fishermen truly understood the content of each question, a series of cognitive interviews was administered. The interviews followed the think-aloud procedure of cognitive interviewing as discussed in *Cognitive Interviewing—A “How to” Guide* (Willis, 1999). The cognitive interviews were conducted using five commercial fishermen, who agreed to be interviewed regarding the questions after they had completed the ILS. All interviewees were participating courses as students. The participants were attending various EDC classes in three different locations over a six-day period. Each participant who agreed to participate in the

cognitive interview was asked to read each question of the ILS, and then asked to state what they thought each question actually meant. The five participants who participated in the cognitive interview sessions reported similar responses regarding what they thought the questions meant. On an individual basis, the participant stated that each question was simple and easily understandable: however, they individually expressed that they did not relate the questions to commercial fishing. They stated that they did not understand how these questions would help in understanding them as learners.

Data collection procedures. A stratified sampling method by regions was used to collect data from the study participants. This method allowed the researcher to obtain sufficient participant numbers to make comparisons by regions for data analysis purposes. Participants were accessible to the instructors in eight geographical regions. Within each of the eight regions, instructors who were teaching classes assisted in this research and provided and collected the completed instruments and returned the completed instruments to the researcher. The geographical regions used in this study were defined by dividing the United States into eight geographical regions identified as the Northeast Atlantic, Mid-Atlantic, Southeast Atlantic, Gulf of Mexico, Great Lakes, Southern Pacific, Pacific Northwest, and Alaska regions. Geographical boundaries are described below for the purpose of clarity and definition of study areas.

1. Northeast Atlantic region was defined as the Atlantic coastal areas at Cape May, New Jersey and extending northward to the United States-Canada border in Maine.
2. Mid-Atlantic region was defined as the Atlantic coastal areas beginning at Cape May, New Jersey and extending southward to the North Carolina-South Carolina state borders.

3. Southeast Atlantic region was defined as the Atlantic coastal areas beginning at the North Carolina-South Carolina border and extending southward to Key West, Florida.
4. Gulf of Mexico region was defined as the coastal Gulf of Mexico area beginning in Key West, Florida; extending north and west along the coastal region of Florida and continuing westward along the Gulf of Mexico areas to the Texas border, continuing southward along the Texas coast ending at the United States-Mexico border.
5. Great Lakes region was defined as the United States territorial waters of the Great Lakes. The region of the lakes beginning on the shorelines of those states bordering the five Great Lakes to the United States-Canada border.
6. Southern Pacific region was defined at the Pacific coastal waters beginning at the United States-Mexico boundary extending northward to the California-Oregon border.
7. Pacific Northwest region was defined as the coastal areas beginning at the California-Oregon border extending northward to the to the United States-Canada border.
8. Alaska region was defined as the coastal waters of Alaska beginning at the United States-Canada boundary and continuing westward and northward to include all coastal waters, and all related bays and fiords, which are geographically known to represent the coastal area of Alaska culminating at the Arctic Ocean in Barrow, Alaska.

To ensure efficient data collection and analysis, the types of commercial fishing operations were reduced to four generalized methods of commercial fishing. These classifications are included for understanding and are described below:

1. Net fisheries include any fishing that utilizes nets to catch target species.
Examples include gill netting, trawling, purse seine, etc.
2. Long-line fisheries include any fishery that utilizes a long-line method of fishing to catch target species such as swordfish, snapper, grouper, and tuna.
3. Trap fisheries include any fishery that utilizes a trap to catch target species such as crab, lobster, blackfish, cod, etc.

4. Rod fisheries include any fishery that uses conventional fishing rod and reels, mechanical or bandit reels, or electrical deep-drop reels to catch target species such as grouper, flounder, snapper, etc.

Collection of data was achieved through the hand delivery of the instruments to study participants in the eight geographical regions. This was accomplished by utilizing the network of national marine safety instructors to administer the instrument to participants enrolled in their EDC courses offered in the fishermen's specific geographical region. A verbal commitment to assist in this study was given by a minimum of three instructors from each of the eight regions of this study.

The instructors, who agreed to participate, received an instructor packet containing the following items.

1. Instructor instructions,
2. Thirty participant packets, and
3. Postage-paid return envelope for the instructors to return the participant packets.

Each instructor was asked to follow specific steps in the instructions:

1. Read the instructor's instructions before removing participant packets.
2. Do not distribute participant packets until the end of the EDC course.
3. Ask all EDC course participants to please participate in the study.
4. Inform all potential participants that the survey is voluntarily and in no way affects their successful completion of the EDC course.
5. Designate a specific location for participants to leave their completed surveys.
6. Ask all participants to leave their surveys at the designated location.
7. Thank all participants for their participation.

8. Place completed participant packets into the postage-paid return envelope; affix return address with the state of class location noted and return to the researcher.

Survey participants received a sealed envelope packet containing:

1. Specific participant instructions, including survey directions,
2. Informed consent document,
3. *Commercial Fishing Worker Survey*, and
4. Pencil for completing the survey.

All participants were informed that their participation in the study was voluntary and that they could choose not to participate in the study. All participant packets were collected by the instructor conducting the course and placed into the provided postage-paid return envelope and returned to the researcher. The specific region was determined by the return address of the instructor designating state of course location. The returned packets were placed into individual folders designated for each individual region, based on the eight regions of the study. All returned instruments continue to be stored in a locked file cabinet at the researcher's residence.

Once the minimum n of respondents from each region was collected, the instruments were scored for data analysis with no identifying data or materials present other than the instrument scores. Any returned instruments with identifying information had the identifying items removed from the instrument and the instrument was returned to the pool of collected instruments.

Data Analysis

Data analysis was conducted using SAS to generate descriptive statistics (i.e., mean, mode, median, frequency, distribution, and standard deviation) to make general

determinations regarding specific research questions. The independent variables of region, education level, and methods were analyzed through ANOVA factorial analysis to determine any potential significance effect upon the eight dimensions of learning preferences that represented the dependent variables of the study. Once ANOVA was complete, it was determined that while most variables had no significance, there were variables that exhibited initial significance and required additional Tukey's pairwise comparison tests to determine if a pairwise significance existed.

Age was treated as a continuous variable for this study and was analyzed by obtaining Pearson Correlation Coefficients, a correlational method for determining significance between independent and dependent variables. The tests determined that there was no significance

The independent variable of Captain's license status which asked respondents for a yes or no answer yielded data which required the use of the *t* tests to assess comparative data analysis against the learning preference dimensions data of the study.

Descriptive statistics combined with the use of ANOVA factorial analysis, *t*-test and Pearson Correlation Coefficient analysis of the data sufficed for the needs of this research to answer the three specific research questions. Further discussion of analysis methods related to each research question found in subsequent sections.

All variables in the demographic survey were considered to be independent variables for statistical comparison. The independent variables identified for this study were:

1. Age,
2. Education level,
3. Captain's license status, and
4. Method of fishing.

Specific research questions were answered from data obtained through the instrument; a detailed listing of the instrument questions related to the research questions is discussed below along with the original research questions for review.

1. What are the learning preferences of commercial fishermen?
2. Are there differences in the learning preferences of commercial fishermen across the eight geographical regions of the study?
3. Are there differences in the learning preferences of commercial fishermen based on the demographical variables?

Research question one was addressed by combining the data from all eight regions using questions 1-44 of the research instrument to identify the learner preferences of commercial fishermen across the eight regions. This compilation contains the actual data of the participants related to their learning preferences obtained from questions 1-44 in the instrument. Descriptive statistics of the data produced learning preferences percentages of the respondents from the eight regions. This was accomplished by combining the data representing the learning preferences identified by respondents from each of the eight regions of the study and dividing the number of respondents in each category by the overall respondents from that individual region.

Once percentages of the study population ($N = 400$) were obtained for each of the four dimensions of the instrument, the percentages were used to extrapolate a number for each dimensional score by using the corresponding percentages of the national population ($N = 280,000$). Assuming that the active dimension represents 35% of the study population, the corresponding extrapolated number of fishermen in the national population would be expected to be $280,000$ multiplied by $.35 = 98,000$ or that 98,000

commercial fishermen $\pm 5\%$ would exhibit the same learning preference on the dimension nationally.

Research question two was addressed by compiling instrument data related to each of the eight individual geographical regions. Once the data for each region was compiled, comparisons of the four dimensions of the instrument were conducted by comparing each region with the means of the dimensional scores with the other seven regions to identify any differences or similarities that may exist between the individual regions.

Research question three was addressed through analysis of the demographic data from the survey to determine if any differences existed across the demographic variables related to the learning preferences of commercial fishermen. ANOVA analysis compared the compiled learning preference dimensional data produced from questions 1-44 from each of the eight regions with the demographic factors reported in questions 45 – 49 (regarding the independent variables of age, education level, captain's license status, and method of fishing).

The variable of age was treated as a continuous variable and subjected to Pearson's correlation coefficient testing. The variable of captain's license was analyzed regarding the ILS scores using *t* tests. The other two variables, education level and method of fishing, were subjected to ANOVA analysis. A Pearson's correlation coefficient test was run on all variables to identify any possible correlations between any variables in the study.

Statistical analysis of the research data to answer question three was conducted using SAS. ANOVA factorial analysis was used to determine the significance of each of

the factors in relation to the other factors. ANOVA analysis demonstrated significance in the relationship of the dependent variables (sensing, intuitive, sequential, and global) and of the independent variables (region and method). It was necessary to perform additional testing. Tukey's test was performed to control the type 1 experiment- wise error rate. The independent variables and their sublevels for this analysis are provided below.

Education level

- a. Did not graduate H.S.
- b. H.S. graduate
- c. Some college or technical school education
- d. College or technical school graduate

Captain's License Status

- a. Yes
- b. No

Method of fishing

- a. Net
- b. Long-line
- c. Trap
- d. Rod.

This research was conducted by sampling in the eight commercial fishing regions of the United States identified in previous chapters. The eight regions descriptions are provided below as a refresher for the reader.

1. Northeast Atlantic region was defined as the Atlantic coastal areas at Cape May, New Jersey and extending northward to the United States-Canada border in Maine.
2. Mid-Atlantic region was defined as the Atlantic coastal areas beginning at Cape May, New Jersey and extending southward to the North Carolina-South Carolina state borders.
3. Southeast Atlantic region was defined as the Atlantic coastal areas beginning at the North Carolina-South Carolina border and extending southward to Key West, Florida.

4. Gulf of Mexico region was defined as the coastal Gulf of Mexico area beginning in Key West, Florida; extending north and west along the coastal region of Florida and continuing westward along the Gulf of Mexico areas to the Texas border, continuing southward along the Texas coast ending at the United States-Mexico border.
5. Great Lakes region was defined as the United States territorial waters of the Great Lakes. The region of the lakes beginning on the shorelines of those states bordering the five Great Lakes to the United States-Canada border.
6. Southern Pacific region was defined at the Pacific coastal waters beginning at the United States-Mexico boundary extending northward to the California-Oregon border.
7. Pacific Northwest region was defined as the coastal areas beginning at the California-Oregon border extending northward to the to the United States-Canada border.
8. Alaska region was defined as the coastal waters of Alaska beginning at the United States-Canada boundary and continuing westward and northward to include all coastal waters, and all related bays and fiords, which are geographically known to represent the coastal area of Alaska culminating at the Arctic Ocean in Barrow, Alaska.

Summary

Data were collected from across the eight commercial fishing regions of the United States. Each region was sampled until a minimum of 50 participants was reached from each region. All study participants had to be actively employed in commercial fishing and be able to read and respond to the CFWS in English to meet the criteria for inclusion in the study. Once the necessary survey data were collected, the data were organized in relation to their respective regions and placed in that region's folder. When all data had been collated, various analysis methods were used to develop statistical data sufficient to answer the three research questions of the study. The sampling and analysis methods used were sufficient to answer the three research questions of the study.

Chapter 4

Findings

The purpose of this research was to identify the learning preferences of commercial fishermen in order to provide effective educational programs for commercial fishermen. This chapter contains the following sections: demographic profile of respondents, research question one, research question two, research question three, and observations.

Demographic Profile of Respondents

Four hundred and thirty-five respondents completed the *Commercial Fishing Worker Survey* (CFWS) across the eight commercial fishing regions of the United States. Sampling was conducted in each of the eight regions to ensure that the collected data would best represent the national population of commercial fishermen. The four demographic questions in the CFWS asked respondents to provide answers regarding their age, education level, captain's license status, and method of fishing. The four demographic questions provided data related to the four variables of the study: age, education level, captain's license status, and method of fishing. Data analyzed from the study participants investigated whether the significant differences within the learning preferences dimensions of commercial fishermen existed. Table 11 presents the demographic characteristics of the study respondents for each region.

Table 11

Demographic Characteristics of Respondents by Region

Region	Resp <i>N</i>	Age \bar{x}	Education						Captain's Lic		Method of Fishing			
			DF %	HS %	SM %	AS %	BS %	Grad %	Yes %	No %	Net %	LL %	Trap %	Rod %
Region 1 NE Atlantic	50	43	0.0	96.0	4.0	0.0	0.0	0.0	8.0	92.0	66.0	0.0	14.0	20.0
Region 2 Mid-Atlantic	57	42	1.8	91.2	7.0	0.0	0.0	0.0	3.5	97.0	12.3	0.0	88.0	0.0
Region 3 SE Atlantic	54	50	5.5	89.0	2.0	4.0	0.0	0.0	6.0	94.4	40.0	4.0	0.0	56.0
Region 4 Gulf of Mexico	53	42	5.6	79.2	8.0	6.0	0.0	2.0	8.0	93.0	70.0	0.0	23.0	8.0
Region 5 Great Lakes	61	46	8.1	85.2	3.3	2.0	2.0	0.0	8.2	92.0	100	0.0	0.0	0.0
Region 6 S. Pacific	56	35	5.4	84.0	7.1	4.0	0.0	0.0	18.0	82.1	75.0	0.0	25.0	0.0
Region 7 NW Pacific	51	39	11.8	77.0	8.0	4.0	0.0	0.0	14.0	86.2	84.3	0.0	14.0	2.0
Region 8 Alaska	53	35	1.8	81.1	8.0	6.0	2.0	2.0	34.0	66.0	100	0.0	0.0	0.0
% <i>N</i> *	100	100	5	85	6	3	5	.5	12	87	69	.5	20	10

Note. *N*= 435. Resp.= Respondents, DF = did not finish High school, SM = some college or technical courses, AS= Associate degree, BS=Bachelors degree, Grad= Graduate degree, and Captains Lic=Captains License, LL= long line.

* Percentages may not add to 100% due to rounding

The respondents included commercial fishermen who completed the instrument from each of the eight regions used in the research. The study was designed to sample a minimum N of 400 respondents to meet power analysis calculations. This was accomplished by collecting a minimum of 50 surveys from each of the eight regions of the study. The eight regions were designed to aid data collection to achieve adequate sampling to represent the national population of commercial fishermen.

The study achieved sampling goals with at least 50 respondents from each region for a total sample of 435 respondents. Since the minimum n of 50 respondents was reached or exceeded, the variability was minimal. The number of respondents from each region ranged from a low of 50 respondents for region one (NE Atlantic) to a high of 61 respondents for region 5 (Great Lakes).

Age. Age was selected as a study variable and was considered as a continuous variable for analysis. In terms of the age of commercial fishermen, there was a wide range regarding commercial fishermen's ages. The results ranged from a minimum age of 18 years to a maximum of 79 years of age. The mean age of the fishermen across all eight regions was 42 years of age. The mean ages of each region varied from a low of 35 years for regions 6 (S Pacific) and 8 (Alaska) to a high of 50 years in region 3 (SE Atlantic) (see Table 11).

Education level. The education level results from participants indicated that 85% of commercial fisherman ($n = 371$) had completed high school (HS) compared to 6% ($n = 22$) of commercial fishermen in the study population reporting they had not finished high school (DF). Of the respondents who reported education past the HS level, 6% ($n = 25$) of the study respondents reported completing some college work, 3% ($n = 13$) of

respondents had earned an associate's degree. The number of fishermen who had earned a bachelors or graduate degree was 0.5% of the study population ($n = 2$) for the overall respondents education level (see Table 11).

Captain's license. This demographic variable was chosen to obtain baseline data regarding whether or not the respondents possessed a USCG Merchant Mariner Captain's license. Captain's licenses are not required for the majority of commercial fishermen. The data regarding captain's license status indicated that 87% of the commercial fishermen in the study population did not have a captain's license ($n = 378$) compared to 12% ($n = 53$) of the commercial fishermen within the study population who had captain's licenses (see Table 11).

Positive responses regarding captain's license status indicated that region 2 (Mid-Atlantic) had the least of number of respondents with just two licensed captains, while region 8 (Alaska) had the highest number of licensed captains with 18 reporting they possessed a captain's license. Regions 6 (Pacific NW) and 8 (Alaska) combined had 53% ($n = 28$) of the respondents with captain's licenses with region 6 reporting $n=10$ and region 8 reporting $n=18$ were licensed captains.

Method of fishing. Although there are many types of commercial fishing and a myriad of modified methods used in commercial fishing, for the purpose of this study, all of the various methods were narrowed down to four basic methods used in commercial fishing: net, long line, trap, and rod. The participants' responses indicated that net fishing was the most widely used method within the study population with 69% ($n = 298$) of the commercial fishermen indicating they primarily used some form of nets for fishing. The least used method of fishing was long-line fishing with just two respondents or 5%

($n = 2$) indicating they primarily fished using long-line methods. The two respondents who indicated long-line use were from region 3 (SE Atlantic) (see Table 11).

Net. Data indicated that net fishing was the most widely used means of fishing in the majority of regions (see Table 11). Region 2 (Mid-Atlantic) had the lowest number of net fishermen 12.3% ($n = 7$), compared to regions 5 (Great Lake) and 8 (Alaska) with both reporting 100% of the participants using net methods. Region 5 had the highest number of net fishermen with 61 respondents reporting they used nets as their primary method of fishing. Region 2 represented the low with 7 respondents reporting the use of nets. The responses from the other six regions reported data ranging from a low of 66% for region 1 (NE Atlantic) to a high in regions 5 (Great Lakes) and 8 (Alaska) with 100% of the fishermen using net methods.

Long line. Long-line fishermen accounted for just .5% ($n = 2$) of the study population (see Table 11). Only region 3 (SE Atlantic) indicated the use of long-line methods. This low number of respondents indicating they used long-line methods may be because the data were collected during the summer months, when most of the long-line vessels were actively at sea fishing.

Most long-line fishing vessels are at sea for extended periods of time ranging from multiple weeks for smaller long-line vessels to multiple months for the larger vessels in the fishery. Due to the long periods at sea, this segment of the commercial fishing population was difficult to access during the conduct of the study.

Trap. Participants indicated that the use of trap fishing represented 20% ($n = 90$) of the study population (see Table 11). The use of traps ranged from no reported use of traps in regions 2, 5, and 7 to region 3 (SE Atlantic) which had the highest use of traps

88% ($n = 50$) of all of the eight regions. The high value for region 3 was primarily the result of the large amount of crab and lobster commercial fishing that occurs in this region, which are primarily trap fisheries.

Rod. The commercial fishermen using the rod method as their primary fishing method represented 10% ($n = 45$) of the study population (see Table 11). Only regions 3 (SE Atlantic), 4 (Gulf), and 7 (Pacific NW) reported the use of rod fishing methods. The responses ranged from a low in regions 1, 2, 5, 6, and 8 reporting zero rod fishermen to a high in region 3 with 56% ($n = 30$) fishermen responding they used rod methods of fishing. Participants in the regions which indicated the use of rod methods, ranged from a low in region 7 with 2%, to the high in region 3 with 30 respondents using rod-fishing methods.

Age in relation to study variables. As previously mentioned, age was treated as a continuous variable, so tables demonstrating the relationship of age to the variables of education level, captain's license status, and method of fishing is provided. Tables are formatted to represent the percentages of the participants' responses by age-range groupings of commercial fishermen in the study population related to the specific variable being discussed.

Education level and age. Table 12 presents the percentages of respondents by age group in relation to the educational level of participants. The participants were asked to provide responses indicating their education level. The results were unexpected, because of the assumption that a much larger number of commercial fishermen would not have completed high school. The few participants who indicated that they held college degrees were a low percentage of the study population 4% ($n =$

19). In addition, those participants who reported they did not finish high school 5% ($n = 23$) were a very low percentage of the total study population. Because of the low percentages for those participants, who did not finish high school or who held college degrees, the majority that had completed high school was the primary focus and represented the highest percentage of the study population.

The fishermen's responses ranged from a low of zero participants in the 78-87 age grouping with a high school education to a high of 88% of the 38-47 age group who had completed high school. The participant responses indicated that commercial fishermen between the ages of 18 and 77 years were more likely to have a high school diploma than those fishermen in the 68-87 years of age range.

Table 12

Education Level of Respondents by Age Group

Age in Years Range	<i>n</i>	DF* %	HS %	Some %	AS %	BS %	Grad %
18-27	82	7	82	9	2	0	0
28-37	95	0	88	8	3	0	0
38-47	108	3	86	5	4	1	0
48-57	84	3	86	5	2	1	2
58-67	57	10	81	2	4	4	0
68-77	8	50	50	0	0	0	0
78-87	1	100	0	0	0	0	0

Note. $N=435$. * DF= did not finish high school, HS = high school, Some = some college, AS=associate degree, BS = bachelor degree, Grad = Graduate work or graduate degree.

Captain’s license and age. Discussion of this variable examines the dispersion of those commercial fishermen holding formal USCG captain’s licenses by the age grouping previously mentioned. Currently no regulation exists that requires commercial fishermen to have a captain’s license.

The responses to captain’s license status indicated that 87% of commercial fishermen did not have a captain’s license. Upon examination of the data analysis, fishermen in the 28-37 age range had the highest number of captain’s licenses with 19% holding captain’s licenses, contrasted to the 78-87 age range with no fishermen holding captain’ licenses. The 18-57 age group accounted for 61% of the study population who held a captain’s license. See Table 13 for the captain’s license status by the age groups.

Table 13

Captain’s License Status by Age Group

Age in Years Range	<i>n</i>	Captain’s License	
		Yes %*	No %*
18-27	82	11	89
28-37	95	19	81
38-47	108	18	88
48-57	84	13	87
58-67	57	2	98
68-77	8	13	86
78-87	1	0	100

Note. *N*=435. * May not equal 100% due to rounding

Method of fishing by age group. The final demographic discussion deals with age groupings as they relate to the method of fishing. These data represented the study participants' responses as related to age. The actual percentages based on age and method of fishing could be influenced by conditions such as fishing season or location. There were possibilities that the respondents may engage in different types of fishing depending on the fishing seasons or by the physical location of the class where the commercial fishermen were asked to participate in this study. The variable, method of fishing, consisted of four methods: net, long line, trap, and rod. Table 14 provides the numbers of participants by fishing method for each age group.

Net fishing represented the major type of fishing used by the commercial fishermen in this study, 68% of the study respondents reported using this method of fishing. The age group of 28-37 years provided the largest percentage with 78% of the commercial fishermen who reported net fishing as their primary method used. The age range of 78-87 indicated the lowest number of respondents with zero fishermen reporting they used nets. Net fishing represented the primary method used participants in the study population.

Participant responses indicated that 21% of the study population reported trap fishing methods as their primary method of fishing. The age group 58-67 reported the highest number of respondents using trap methods with 35% of the participants selecting trap fishing as their primary method; this contrasts with the 78-87 age group where no fishermen reported the use of trap methods.

Rod fishing accounted for 11% of the responses of the study participants. The 68-77 age group represented the highest percentage with 25% of the respondents

indicating they primarily used the rod fishing method. In contrast, the 78-87 age group reported no rod fishermen. The 38-47 age group represented 67% of those fishermen who utilized rod fishing methods.

Long-line fishing responses had the lowest number of participants utilizing this method of fishing with just two respondents across all the age ranges reporting this as their primary method of fishing. The 78-87 age group represented the highest percentage of study participants who reported using long-line methods with one respondent (100%). This high percentage was due to only one participant who reported long-line fishing as the primary method of fishing. The 38-47 age group indicated that 0.9% ($n=1$) of the age group participated in long-line fishing.

Table 14

Method of Fishing by Age Group

Age in Years		Net	Long line	Trap	Rod
Range	<i>n</i>	%*	%*	%*	%*
18-27	82	68	0	24	7
28-37	95	78	0	17	5
38-47	108	71	0.9	16	12
48-57	84	69	0	19	12
58-67	57	47	0	35	18
68-77	8	50	0	25	25
78-87	1	0	100	0	0

Note. $N=435$. * Percentages may not equal 100% due to rounding

Research Question One

What are the learning preferences of commercial fishermen? After compilation of the respondent data, the data were analyzed to produce simple descriptive statistics regarding the learning preferences dimensional scores based on the *Index of Learning Styles* (ILS). See Appendix D for scoring information on the instrument. After analysis for descriptive statistics was completed, means and standard deviations were calculated for each of the individual eight dimensions of the instrument. See Table 15 for the means and standard deviations of the learning preference dimension scores.

Table 15

Means and Standard Deviations of Learning Preference Dimension Scores

Learning Dimension	\bar{x}	SD
Active	6.75	2.24
Reflective	4.25	2.24
Sensing	5.87	2.41
Intuitive	5.13	2.41
Visual	6.58	2.25
Verbal	4.43	2.25
Sequential	6.13	2.29
Global	4.87	2.29

Note. N=435.

The means of participant responses from each of the eight regions as scored by the instrument were combined and calculated as percentages of the study population for each of the eight dimensions of the instrument. These compiled data produced percentages for each of the eight dimensions of the instrument across the eight study regions. After all calculations were complete, the data indicated that the study population demonstrated higher percentages of preference for the active, sensing, visual, and sequential dimensions as scored by the instrument. See Table 16 for the percentages of the learning dimension preference of the total sample and the corresponding confidence levels.

Table 16

Percentages of the Learning Preference Dimensions of the Total Sample and Corresponding Confidence Levels

Dimension	% of <i>n</i>	CL%
Active	62	[57.4, 66.6]
Reflective	38	[33.4, 42.6]
Sensing	51	[46.4, 55.6]
Intuitive	49	[44.4, 53.6]
Visual	60	[55.4, 64.6]
Verbal	40	[35.4, 44.6]
Sequential	57	[52.4, 61.6]
Global	43	[38.4, 47.6]

Note. *N*=435. All confidence levels calculated at 95%, $\alpha = .05$

Extrapolation of percentages to the national population of commercial

fishermen. Assuming that the national populations of commercial fishermen were similar to the study population, extrapolation allows for the estimation of the number of fishermen in the national population of commercial fishermen who may exhibit similar learning preferences. The percentages of each of the eight individual dimensions from all eight regions were used as the basis for extrapolation to offer insight concerning the predicted learning preferences of the larger national population of commercial fishermen. The extrapolation to represent the national population was performed by taking the compiled responses percentage of each individual dimension and inserting the percentages into a simple extrapolation formula. The formula used to estimate the national population (N) of commercial fisherman was multiplied by each dimension's percentage score to achieve an extrapolated value of the number of commercial fishermen in the national population who could reasonably be expected to demonstrate the same learning preferences.

As an example, the national population of commercial fishermen was estimated at 280,000 individuals, so using the formula and the percentage obtained for the active dimension, results in the equation of $280,000 \times .61 = 172,368 \pm 5\%$. This is the extrapolated number of commercial fishermen who reasonably would be expected to exhibit similar learning preference scores on the active dimension. Table 17 presents the projected extrapolations of the learning preference dimensions of the national population and the confidence levels of the extrapolations.

The eight individual learning preference dimensions are actually four-dimensional pairs with each dimension having an inverse dimension as part of the pair. The pairs

were designed to allow for a determination of the learner’s preference regarding two inverse dimensions or, in non-technical language, a learner’s preference is identified as a higher score on one of the paired items. The paired dimensions are as the follows: active/reflective, sensing/intuitive, visual/verbal, and sequential/global.

Table 17

Projected Extrapolations of Learning Preferences of the National Population With Confidence Levels of Extrapolations

Dimension	Estimated N of fishermen	95% Confidence levels
Active	172,368	[160,720, 186,480]
Reflective	109,007	[93,520, 119,280]
Sensing	149,003	[129,920, 155,680]
Intuitive	131,667	[124,320, 150,080]
Visual	167,342	[155,120, 180,880]
Verbal	112,666	[99,120, 124,880]
Sequential	156,047	[146,720, 172,480]
Global	123,651	[107,520, 133,280]

Note: National population of commercial fishermen is estimated at $N = 280,000$. All confidence levels calculated at 95% - $\alpha = .05$

The four preferences as identified by respondents were the active, sensing, visual, and sequential learning preference dimensions. The learning preference dimensions are explained based on what the study participants indicated as their learning preference dimensions. Discussion is restricted to the four learning dimensional preferences identified by study respondents as their learning preferences.

Analysis of the study data indicated that 62% of the commercial fishermen had a learning preference for the active dimension. The active dimension indicates that the

learner likes to take an active part in learning. An active learner tends to be more interested in information that the learners perceive as valuable or of benefit to themselves. Often the active learner responds well to assignments that require learners be proactive and self-directed in obtaining information on their own or in groups to complete the assignment. Learning opportunities to enable the active learner to participate directly could incorporate activities such as group or individual presentations, teach-back opportunities, online community learning, or forums.

The preference of the sensing dimension by 51% of the study participants indicated that the learner demonstrated a preference towards learning factual material and using conventional methods to solve problems. Sensing learners tend to dislike complications or unseen surprises, sensing learners often display negative reactions to tests in which the material has not been covered in class. Sensing learners tend to exhibit good memory of facts and tasks and usually prefer hands-on tasks. A learner who demonstrates a preference for the sensing dimension is often a patient and practical learner who tends to be very careful and tedious concerning assignment of tasks and may learn best when the task or activity has real-world connections and has perceived value to the learner.

The visual dimension represented 60% of the study participants who indicated that they preferred the visual learning dimension. Visual learners remember what they see whether it is diagrams, pictures, figures, or flowcharts and use this information to reinforce spoken or written material. Most individuals tested by the *Index of Learning Styles* have shown a preference towards the visual dimension; however, many courses are taught using a minimum of visual aids.

The study participants indicated a strong preference towards the sequential dimension with 57% of respondents reporting a preference for the sequential learning dimension. The sequential learner likes learning in a linear order with each step falling into place after the previous one. Sequential learners often have difficulty seeing the big picture; but, by following the steps, arrive at a correct solution to a problem or test. For the sequential learner, it is important for an instructor to do things in a linear manner without taking large steps at once or switching topics too quickly. Failure to consider a linear progression may create confusion for the sequential learner who often needs more time to grasp a thorough understanding of the material.

Research Question Two

Are there differences in the learning preferences of commercial fishermen across the eight geographical regions of the study? See Table 18 for the respondent mean scores concerning the learning preference dimensions for the eight geographical regions.

The data obtained from each region were analyzed through the use of ANOVA testing. After ANOVA testing of the eight dimensions (active, reflective, verbal, visual, sensing, intuitive, sequential, and global), results were obtained regarding the effect of the independent variable region and the eight learning preference dimensional scores from the eight regions. Discussion of the learning preference dimensions begins with the active/reflective pair.

ANOVA analysis of learning preference dimensions by region. ANOVA comparison of the active dimension indicated no statistical significance by region. See Table 19 for the ANOVA analysis of the active learning preference dimension by region. The reflective dimension component also failed to yield statistical significance with

regard to region. Each of the eight learning preference dimensions is paired to comprise the learning preference dimensions as measured by the instrument. The learning preference dimensions are paired as: (active/reflective, sensing/intuitive, visual/verbal, and sequential/global). Due to this pairing, ANOVA analysis produces identical results for each of the paired dimensions

Table 18

Respondent Mean Scores for Learning Preference Dimensions by Geographical Region

Study Regions	ACT \bar{x}	REF \bar{x}	SNS \bar{x}	INT \bar{x}	VIS \bar{x}	VRB \bar{x}	SEQ \bar{x}	GLO \bar{x}
Region 1 NE Atlantic	6.80	4.20	4.42	6.58	6.22	4.78	6.16	4.84
Region 2 Mid-Atlantic	6.75	4.26	5.02	6.19	6.82	4.18	6.39	4.53
Region 3 SE Atlantic	7.35	3.65	6.07	4.93	7.15	3.85	6.81	4.09
Region 4 Gulf of Mexico	6.49	4.51	6.55	4.47	6.77	4.25	6.42	4.58
Region 5 Great Lakes	6.72	4.28	6.93	4.10	6.23	4.66	5.85	5.18
Region 6 S. Pacific	6.89	4.11	4.55	6.46	6.71	4.29	6.23	4.77
Region 7 Pacific NW	6.39	4.61	6.29	4.71	6.25	4.75	6.00	5.00
Region 8 Alaska	6.80	4.63	7.04	3.96	6.41	4.59	5.22	5.75
Grand Mean	6.78	4.28	5.86	5.17	6.57	4.42	6.13	4.84

Note. N = 435. ACT=active, REF=reflective, SNS=sensing, INT=intuitive, VIS=visual, VRB=verbal, SEQ=sequential, GLO= global

Table 19

ANOVA Analysis of the Active Learning Preference Dimension by Region

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Region	7	33.154	4.736	0.94	0.4744
Error	427	2149.030	5.033		
Corrected Total	434	2182.184			

Note. $\alpha = .05$

All ANOVA tables represent two paired dimensions, which are the inverse dimensions of each other due to the instrument design and scoring methods. The Index of Learning Styles instrument scores only in one-dimensional direction. Due to this scoring method, a respondent's score on the active/reflective pair is either active or reflective and this fact creates the inverse relationship. Table 20 provides the ANOVA analysis of the reflective learning reference dimension by region.

Table 20

ANOVA Analysis of the Reflective Learning Preference Dimension by Region

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Region	7	33.154	4.736	0.94	0.4744
Error	427	2149.030	5.033		
Corrected Total	434	2182.184			

Note. $\alpha = .05$

The ANOVA analysis of the paired visual/verbal learning preference dimension indicated the visual dimension produced no statistical significance. See Table 21 for the ANOVA analysis of the visual learning preference dimension by region.

Table 21

ANOVA Analysis of the Visual Learning Preference Dimension by Region

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Region	7	44.03	6.29	1.24	0.28
Error	427	2162.29	5.06		
Corrected Total	434	2206.32			

Note. $\alpha = .05$

The verbal dimension also failed to produce statistical significance in the ANOVA analysis. See Table 22 for the ANOVA analysis of the verbal learning preference dimension by region. The paired visual/verbal learning preference dimensions are opposite, or mirrored, dimensions of each other and produced identical ANOVA results.

Table 22

ANOVA Analysis of the Verbal Learning Preference Dimension by Region

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Region	7	44.03	6.29	1.24	0.28
Error	427	2162.29	5.06		
Corrected Total	434	2206.32			

Note. $\alpha = .05$

The ANOVA analysis of the sensing/intuitive mode revealed that the sensing dimension had statistical significance by region. See Table 23 for the ANOVA analysis of the sensing learning preference dimension by region. A follow-up Tukey's test indicated that there was significance by region regarding the sensing learning preference dimension. Significance occurred between the Alaska (Region 8) and NE Atlantic

(Region 1), Alaska (Region 8) and Mid Atlantic (Region 2), and Alaska (Region 8) and Southern Pacific (Region 6). Comparison of the means offered that the mean sensing score for Alaska was significantly higher than the means for NE Atlantic, Mid-Atlantic and Southern Pacific regions. Comparisons of the mean scores produced that the NE Atlantic (Region 1) had a low mean score of 4.42, and Alaska (Region 8) had the highest mean high score of 7.04

Table 23

ANOVA Analysis of the Sensing Learning Preference Dimension by Region

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Region	7	426.34	60.91	12.48	<0.0001
Error	427	2064.45	4.88		
Corrected Total	434	2510.79			

Note. $\alpha = .05$

The ANOVA analysis of the sensing/intuitive mode also indicated that the intuitive learning preference dimension had statistical significance by region. See Table 24 for the ANOVA analysis of the intuitive learning preference dimension by region. A follow-up Tukey's test indicated that there was significance by region related to the learning preference dimension intuitive. The significance occurred between the regions of NE Atlantic and Alaska, Mid-Atlantic and Alaska, and Southern Pacific and Alaska.

Upon comparison of the mean scores of the intuitive dimension by region, NE Atlantic and Alaska demonstrated the largest significance by dimensional means across the eight regions. Comparisons of the pair indicated that the NE Atlantic had a mean high score of 6.58, in contrast to Alaska with a mean low score of 3.96.

The analysis indicated that since the high and lows were both contained within the regions of NE Atlantic and Alaska, there was significance by region within the sensing/intuitive dimension. As a reminder, paired sensing/intuitive learning preference dimensions are opposite, or mirrored, dimensions of each other and produced identical ANOVA results.

Table 24

ANOVA Analysis of the Intuitive Learning Preference Dimension by Region

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Region	7	426.34	60.91	12.48	<0.0001
Error	427	2064.45	4.88		
Corrected Total	434	2510.79			

Note. $\alpha = .05$

The ANOVA analysis of the inverse sequential/global pair indicated that the sequential learning preference dimension demonstrated statistical significance in regards to region. Follow-up Tukey's tests of the sequential dimension revealed significance regarding the regions of SE Atlantic and Alaska

Comparison of the mean scores of the sequential dimension by region, it was determined that the SE Atlantic and Alaska regions demonstrated the largest difference in dimensional means across the eight regions. Comparisons of the pair indicated that the SE Atlantic region produced a mean high score of 6.81, in contrast to the Alaska region with a mean low score of 5.22. See Table 25 for the ANOVA analysis of the sequential learning preference dimension by region.

Table 25

ANOVA Analysis of the Sequential Learning Preference Dimension by Region

Source	<i>DF</i>	Sum of Squares	Mean Square	<i>F</i>	<i>Pr > F</i>
Region	7	95.81	13.69	2.68	0.010
Error	427	2180.98	5.11		
Corrected Total	434	2276.79			

Note. $\alpha = .05$

The ANOVA analysis of the sequential/global pair indicated that the global learning dimension demonstrated statistical significance related to region. Follow-up Tukey's tests of the global dimension revealed significance between the Alaska and SE Atlantic regions. Upon comparison of the mean scores of the global dimension by region, it was determined that Alaska and SE Atlantic regions demonstrated the largest difference in the means of the eight regions.

Comparisons of the pair indicated that the Alaska region offered a mean high score of 5.75, in contrast to the SE Atlantic region with a mean low score of 4.09. The findings indicated that since the high and low means were both contained within the Alaska and SE Atlantic regions, the sequential/global dimensions differed by region. See Table 26 for the ANOVA analysis of the global learning preference dimension by region. The learning preference dimensions of sensing/intuitive are opposite, or mirrored pairs, as measured by the study instrument and each learning preference dimensional pair produced identical ANOVA results. This is true for all of the ANOVA analysis of the learning preference dimensions in this study. Consideration was given to combining all of the dimension pairs into four paired tables, however separate tables were created to allow for ease of understanding by the reader.

Table 26

ANOVA Analysis of the Global Learning Preference Dimension by Region

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Region	7	95.81	13.69	2.68	0.010
Error	427	2180.98	5.11		
Corrected Total	434	2276.79			

Note. $\alpha = .05$

Research Question Three

Are there differences in the learning preferences of commercial fishermen based on the demographic variables? The demographic variables included:

- a. Age,
- b. Education level,
- c. Captain's license status, and
- d. Method of fishing.

Each of the identified independent variables was subjected to various testing methods to examine the potential effects of each variable upon the results of the ILS.

Age. All participant responses regarding the variable of age were treated as continuous data and were analyzed using the Pearson Correlation Coefficients test to determine any potential correlations between the variable age and the eight dimensions of the learning preferences of the instrument. The correlational analysis of the variable age demonstrated no statistical significance when compared to the eight dimensions of the learning preference results. See Table 27 for the Pearson Correlation Coefficients by age and learning preference dimensions.

Table 27

Pearson Correlation Coefficients by Age and Learning Preference Dimensions

Learning Dimension	Age P/R
Active	- 0.037 0.441
Reflective	0.037 0.441
Sensing	-0.022 0.644
Intuitive	0.022 0.644
Visual	- 0.067 0.162
Verbal	0.067 0.162
Sequential	0.073 0.130
Global	- 0.073 0.130
Age	1.000

Note. *N* = 435.

ANOVA analysis of learning preference dimensions by education level.

The discussion of the learning preference dimensions by education level begins with Table 28 presenting the means and standard deviations of the eight learning preference dimensions by education level. This table was prepared to allow the reader to visually compare the means and standard deviations for each of the learning preference dimensions as related to education level.

Table 28

Means and Standard Deviations for Education Level by Learning Preference Dimension

Dimension <i>n</i>	DF 22		HS 369		Some 25		AS 13		BS 4		Grad 2	
	\bar{x}	<i>SD</i>	\bar{x}	<i>SD</i>	\bar{x}	<i>SD</i>	\bar{x}	<i>SD</i>	\bar{x}	<i>SD</i>	\bar{x}	<i>SD</i>
Active	6.22	1.79	6.78	2.27	7.00	1.78	6.54	2.44	7.00	2.16	3.50	4.95
Reflective	4.77	1.79	4.21	2.27	4.00	1.78	4.46	2.44	4.00	2.16	7.50	4.95
Sensing	5.82	2.40	5.76	2.41	6.08	2.48	7.08	2.14	7.50	1.29	8.50	2.12
Intuitive	5.18	2.40	5.21	2.41	4.92	2.48	3.92	2.14	3.50	1.29	2.50	2.12
Visual	6.68	1.99	6.60	2.29	6.12	2.56	6.38	1.26	7.00	0.82	7.50	2.12
Verbal	4.32	1.99	4.40	2.29	4.88	2.56	4.62	1.26	4.00	0.82	3.50	2.12
Sequential	6.18	2.56	6.12	2.31	5.92	2.36	6.69	1.44	5.75	2.21	7.00	0.00
Global	4.82	2.56	4.88	2.31	5.08	2.36	4.31	1.44	5.25	2.21	4.00	0.00
Region	5.27	1.67	4.38	2.28	4.92	2.34	5.62	1.89	5.25	1.83	6.00	2.83

Note. DF = did not finish high school, HS = high school, Some = some college, AS = Associate's degree, BS = Bachelor's degree, Grad = Graduate work or graduate degree

The ANOVA analysis of the active/reflective pair indicated that the active dimension in regards to education level produced no statistical significance. See Table 29 for the ANOVA analysis of the active learning preference dimension by education level. The ANOVA analysis of the reflective dimension also failed to yield statistical significance as expected since they are inverse pairs. See Table 30 for the ANOVA analysis of the reflective learning preference dimension by education level. It is important for the reader to note, that all of the paired learning preference dimensions are mirrored or opposite of each other, and produce identical ANOVA results.

Table 29

ANOVA Analysis of the Active Learning Preference Dimension by Education Level.

Source	<i>DF</i>	Sum of Squares	Mean Square	<i>F</i>	<i>Pr > F</i>
Education level	5	29.94	5.99	1.19	0.32
Error	429	2152.25	5.02		
Corrected Total	434	2182.18			

Note. $\alpha = .05$

Table 30

ANOVA Analysis of the Reflective Learning Preference Dimension by Education Level

Source	<i>DF</i>	Sum of Squares	Mean Square	<i>F</i>	<i>Pr > F</i>
Education level	5	29.94	5.99	1.19	0.32
Error	429	2152.25	5.02		
Corrected Total	434	2182.18			

Note. $\alpha = .05$

The ANOVA analysis of the sensing/intuitive pair indicated that the sensing dimension related to education level produced no statistical significance. See Table 31 for the ANOVA analysis of the sensing learning preference dimension by education level. The analysis of the intuitive dimension also failed to yield statistical significance in the ANOVA. See Table 32 for the ANOVA analysis of the Intuitive learning preference dimension by education level. It is important to note that all of paired learning preference dimensions are inverse dimensions of each other, and as such, produce identical ANOVA results.

Table 31

ANOVA Analysis of the Sensing Learning Preference Dimension by Education Level

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Education level	5	47.17	9.43	1.64	0.15
Error	429	2463.62	5.74		
Corrected Total	434	2510.79			

Note. $\alpha = .05$

Table 32

ANOVA Analysis of the Intuitive Learning Preference Dimension by Education Level

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Education level	5	47.17	9.43	1.64	0.15
Error	429	2463.62	5.74		
Corrected Total	434	2510.79			

Note. $\alpha = .05$

The ANOVA analysis of the visual/verbal pair indicated that the visual learning preference dimension related to education level produced no statistical significance. See Table 33 for the ANOVA analysis of the visual learning preference dimension by education level. The analysis of the verbal learning preference dimension also failed to yield statistical significance in the ANOVA. See Table 34 for the ANOVA analysis of the verbal learning preference dimension by education level. It is important to note that all of paired learning preference dimensions are inverse dimensions of each other, and as such, produce identical ANOVA results.

Table 33

ANOVA Analysis of the Visual Learning Preference Dimension by Education Level

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Education level	5	8.50	1.70	0.33	0.89
Error	429	2197.82	5.12		
Corrected Total	434	2206.32			

Note. $\alpha = .05$

Table 34

ANOVA Analysis of the Verbal Learning Preference Dimension by Education Level

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Education level	5	8.50	1.70	0.33	0.89
Error	429	2197.82	5.12		
Corrected Total	434	2206.32			

Note. $\alpha = .05$

The ANOVA analysis of the sequential/global pair indicated that the sequential learning preference dimension in regards to education level produced no statistical significance. See Table 35 for the ANOVA analysis of the sequential learning preference dimension by education level. The analysis of the global learning preference dimension also failed to yield statistical significance in the ANOVA. See Table 36 for the ANOVA analysis of the global learning preference dimension by education level. It is important to note that all of paired learning preference dimensions are inverse dimensions of each other, and as such, produce identical ANOVA results

Table 35

ANOVA Analysis of the Sequential Learning Preference Dimension by Education Level

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Education level	5	7.41	1.48	0.28	0.92
Error	429	2269.40	5.30		
Corrected Total	434	2276.80			

Note. $\alpha = .05$

Table 36

ANOVA Analysis of the Global Learning Preference Dimension by Education Level

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Education level	5	7.41	1.48	0.28	0.92
Error	429	2269.40	5.30		
Corrected Total	434	2276.80			

Note. $\alpha = .05$

T-test analysis of learning preference dimensions by captain’s license. As discussed earlier in chapter two, commercial fishermen are generally not required to have a USCG captains license. As each of the paired learning preference dimensions are inverse of each other, the *t*-test analysis produced identical *t*-test results for each of the four pairs of learning preference dimensions.

The *t*-test analysis of the active/reflective learning preference dimensional pair yielded no statistical significance related to individuals who held a captain’s license and the active learning preference dimension. See Table 37 for the *t*-test results for the active learning preference dimension by commercial fishermen who held a captain’s license.

Table 37

T-test Results for the Active Learning Preference Dimension by Captain’s License

Capt.’s Lic	<i>n</i>	\bar{x}	<i>SD</i>	<i>t</i>	<i>Pr > [t]</i>
No	382	7.75	2.25	0.10	0.917
Yes	53	6.71	2.20		

Note. $\alpha = .05$

The *t*-test analysis yielded no statistical significance related to the possession of a captain’s license and the reflective learning preference dimension. See Table 38 for the *t*-test results for the reflective learning preference dimension by commercial fishermen who held a captain’s license. As the paired learning preference dimensions, are inverse or mirrored opposites of each other as noted before. It is important for the reader to note that the active/reflective learning preference dimensional pairs produced identical *t*-test results.

Table 38

T-test Results for the Reflective Learning Preference Dimension by Captain's License

Capt.'s Lic	<i>n</i>	\bar{x}	<i>SD</i>	<i>t</i>	<i>Pr > [t]</i>
No	382	4.25	2.25	-0.10	0.917
Yes	53	4.28	2.20		

Note. $\alpha = .05$

The *t*-test analysis of the sensing /intuitive learning preference dimensions pair yielded no statistical significance related to possession of a captain's license and the sensing learning preference dimension. See Table 39 for the *t*-test values of the sensing learning preference dimension by commercial fishermen who held a captain's license.

Table 39

T-test Values of the Sensing Learning Preference Dimension by Captain's License

Capt.'s Lic	<i>n</i>	\bar{x}	<i>SD</i>	<i>t</i>	<i>Pr > [t]</i>
No	382	5.79	2.41	- 1.82	0.691
Yes	53	6.43	2.30		

Note. $\alpha = .05$

The *t*-test analysis yielded no statistical significance related to captain's license and the intuitive learning preference dimension. See Table 40 for the *t*-test values of the intuitive learning preference dimension by commercial fishermen who held a captain's license. As a reminder, since the paired dimensions are mirrored opposites of each other, it is important to note that that sensing/intuitive learning preference dimensions produced identical *t*-test results.

Table 40

T-test Values of the Intuitive Learning Preference Dimension by Captain's License

Capt.'s Lic	<i>n</i>	\bar{x}	<i>SD</i>	<i>t</i>	<i>Pr > [t]</i>
No	382	5.21	2.41	1.82	0.691
Yes	53	4.57	2.30		

Note. $\alpha = .05$

The *t*-test analysis of the visual/verbal learning preference dimensions pair yielded no statistical significance related to possession of a captain's license and the visual learning preference dimension. See Table 41 for the *t*-test values of the visual learning preference dimension by commercial fishermen who held a captains' license.

Table 41

T-test Values of the Visual Learning Preference Dimension by Captain's License

Capt.'s Lic	<i>n</i>	\bar{x}	<i>SD</i>	<i>t</i>	<i>Pr > [t]</i>
No	382	6.52	2.30	-1.34	0.182
Yes	53	6.96	1.88		

Note. $\alpha = .05$

The *t*-test analysis yielded no statistical significance related to the possession of a captain's license and the verbal learning preference dimension. See Table 42 for the *t*-test values of the verbal learning preference dimension by captain's license. It is important to remember that the inverse sensing/intuitive learning preference dimensional pair produced identical *t*-test results.

Table 42

T-test Values of the Verbal Learning Preference Dimension by Captain's License

Capt.'s Lic	<i>n</i>	\bar{x}	<i>SD</i>	<i>t</i>	<i>Pr > [t]</i>
No	382	4.48	2.30	1.34	0.182
Yes	53	4.04	1.88		

Note. $\alpha = .05$

The *t*-test analysis of the sequential/global learning preference dimension pair yielded no statistical significance related to captain's license and the sequential learning preference dimension. See Table 43 for the *t*-test values of the sequential learning preference dimension by commercial fishermen who held a captain's license.

Table 43

T-test Values of the Sequential Learning Preference Dimension by Captain's License

Capt.'s Lic	<i>n</i>	\bar{x}	<i>SD</i>	<i>t</i>	<i>Pr > [t]</i>
No	382	6.15	2.27	0.56	0.572
Yes	53	5.96	2.47		

Note: $\alpha = .05$

The *t*-test analysis yielded no statistical significance related to the captain's license and the global learning preferences dimension. See Table 44 for the *t*-test values of the global learning preference dimension by commercial fishermen who held a captain's license. As with the previous paired learning preference dimensions, the sequential/global learning preference dimensional pair produced identical *t*-test results.

Table 44

T-test Values of the Global Learning Preference Dimension by Captain's License

Capt.'s Lic	<i>n</i>	\bar{x}	<i>SD</i>	<i>t</i>	Pr > [<i>t</i>]
No	382	4.85	2.27	- 0.56	0.572
Yes	53	5.04	2.47		

Note. $\alpha = .05$

ANOVA analysis of learning preference dimensions by method of fishing. The ANOVA analysis of the active/reflective learning preference dimensions pair indicated that the active learning preference dimension related to the method of fishing produced no statistical significance. See Table 45 for the ANOVA analysis of the active learning preference dimension by the method of fishing. As a reminder, all of paired learning preference dimensions are inverse dimensions of each other and produce identical ANOVA results. The ANOVA analysis of the reflective learning preference dimension related to method of fishing also failed to produce statistical significance in the ANOVA. See Table 46 for the ANOVA analysis of the reflective learning preference dimension by method of fishing.

Table 45

ANOVA Analysis of the Active Learning Preference Dimension by Method of Fishing

Source	<i>DF</i>	Sum of Squares	Mean Square	<i>F</i>	<i>Pr > F</i>
Method	3	3.77	1.26	0.25	0.86
Error	431	2178.42	5.05		
Corrected Total	434	2182.18			

Note. $\alpha = .05$

Table 46

ANOVA Analysis of the Reflective Learning Preference Dimension by Method of Fishing

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Method	3	3.77	1.26	0.25	0.86
Error	431	2178.42	5.05		
Corrected Total	434	2182.18			

Note. $\alpha = .05$

The ANOVA analysis of the sensing/intuitive mode indicated that both aspects of the sensing/intuitive dimension were statistically different in relation to the method of fishing. Table 47 presents the ANOVA analysis of the sensing learning preference dimension by method of fishing. As previously mentioned, the sensing and intuitive learning preference dimensions produced identical scores in the ANOVA analysis.

Table 48 presents the ANOVA analysis for the comparison of the intuitive learning preference dimension by the method of fishing. Follow-up analysis using Tukey's tests confirmed that the significance of the sensing/intuitive learning preference dimensions, related to method of fishing was found between the net and trap methods.

Table 47

ANOVA Analysis of the Sensing Learning Preference Dimension by Method of Fishing

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Method	3	79.66	26.55	4.71	0.003
Error	431	2431.13	5.64		
Corrected Total	434	2510.79			

Note: $\alpha = .05$

After review of the Tukey's test analysis, it was determined that net and trap methods of fishing demonstrated the only significance of the four methods of fishing in relation to method of fishing. Comparisons of the mean scores related to method of fishing offered that net method of fishing had the high mean of 6.15, in contrast to the trap method, with the low mean of 5.17.

Table 48

ANOVA Analysis of the Intuitive Learning Preference Dimension by Method of Fishing

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Method	3	79.66	26.55	4.71	0.003
Error	431	2431.13	5.64		
Corrected Total	434	2510.79			

Note. $\alpha = .05$

This finding indicated that since the high and low mean scores were both contained within the net/trap methods of fishing, there was a significant difference in the sensing and intuitive learning preference dimensions by method of fishing. As a reminder, the paired sequential/global learning preference dimensions are opposite, or mirrored, dimensions of each other and produce identical ANOVA results.

Table 49 presents the means and standard deviations for the sensing and intuitive learning preference dimensions by method of fishing. This table was included to allow the reader to make visual references to the means and standard deviations obtained from the analysis. The means were used to determine where the largest difference in the means was located and used to determine the levels of significance of the sensing and intuitive learning preference dimensions related to the method of fishing. [

Table 49

Means and Standard Deviations for the Sensing and Intuitive Learning Preference Dimensions by Method of Fishing

Method	N	Sensing		Intuitive	
		\bar{x}	SD	\bar{x}	SD
Long Line	2	7.00	1.41	4.00	1.41
Net	297	6.15	2.27	4.85	2.27
Rod	46	5.41	2.57	5.57	2.57
Trap	90	5.17	2.61	5.83	2.61

Note. N = 435.

The ANOVA analysis of the visual/verbal mode indicated that the verbal learning preference dimension produced no statistical significance related to method of fishing. See Table 50 for the ANOVA analysis of the visual learning preference dimension by method of fishing. The analysis of the verbal dimension also failed to yield statistical significance in the ANOVA. See Table 51 for the ANOVA analysis of the verbal learning preference dimension by method of fishing. As a reminder, all of paired learning preference dimensions are inverse dimensions of each other and produce identical ANOVA results.

Table 50

ANOVA Analysis of the Visual Learning Preference Dimension by Method of Fishing

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Method	3	24.44	8.15	1.61	0.19
Error	431	2181.88	5.06		
Corrected Total	434	2206.32			

Note. $\alpha = .05$

Table 51

ANOVA Analysis of the Verbal Learning Preference Dimension by Method of Fishing

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Method	3	24.44	8.15	1.61	0.19
Error	431	2181.88	5.06		
Corrected Total	434	2206.32			

Note. $\alpha = .05$

The ANOVA analysis of the paired sequential/global learning preference dimensions pair indicated that the sequential learning preference dimension produced no statistical significance related to the method of fishing. Table 52 presents the ANOVA analysis of the sequential learning preference dimension by method of fishing. The analysis of the intuitive dimension also failed to yield statistical significance in the ANOVA. See Table 53 for the ANOVA analysis of the global learning preference dimension by method of fishing. As a reminder for the reader, the paired sequential/global learning preference dimensions are opposite, or mirrored, dimensions of each other and produced identical ANOVA results.

Table 52

ANOVA Analysis of the Sequential Learning Preference Dimension by Method of Fishing

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Method	3	25.97	8.66	1.66	0.18
Error	431	2250.82	5.22		
Corrected Total	434	2276.79			

Note. $\alpha = .05$

Table 53

ANOVA Analysis of the Global Learning Preference Dimension by Method of Fishing

Source	DF	Sum of Squares	Mean Square	F	Pr > F
Method	3	25.97	8.66	1.66	0.18
Error	431	2250.82	5.22		
Corrected Total	434	2276.79			

Note. $\alpha = .05$

Observations

Several observations related to the conduct of the research study were noted. One of the observations was centered on a critical requirement needed for any researcher wishing to study commercial fishermen populations. It is vital that the researcher be able to speak the jargon used by commercial fishermen since this allows for an easier access to the fishermen. The ability to communicate in the jargon of the commercial fishermen is the primary skill needed by a researcher to be accepted by this population. The ability to speak the jargon also allows the researcher to better understand the fishermen's responses to interview questions or survey instruments.

The ability to access the commercial fishermen population is crucial and often impossible. It should be added that any researcher wishing to conduct effective research related to the commercial fisherman needs to have a point of contact, this could be someone who has either made previous contact with the fishermen, or who has a contact within the fishing community. It would to a researcher's advantage to be escorted by someone accepted within the fishing community and who is willing to assist getting the researcher and the research study introduced to the commercial fishermen.

Since the surveys were distributed by instructors who assisted in this research, it is not known if any of the respondents had trouble taking part in the survey. It is highly likely, given the camaraderie that exists among the fishermen, that if a commercial fisherman wanted to complete the survey and was unable to do so, because of education level or reading ability, other fishermen would have assisted the individual in completing the survey. However, there is no way to determine if this occurred.

Commercial fishermen are an independent group of individuals who are highly distrustful of anything connected to the government or large organizations. They often view researchers and their research with skepticism, because of past experiences with researchers who have negatively influenced their ability to make a living. They are fearful that participating in research may have a negative impact on fishing seasons, bag limits, or licenses.

Another observation deals with the solitary nature of the commercial fishermen and the isolation of the physical locations while docked. Many commercial fishing vessels are part of family-owned businesses and, as such, are kept at the family (or friends) dock behind their house or in some remote bay or river. The same is true of the fish-houses where the fishermen sell their catch. Often the only way to find the fishermen in a particular region is to find the fish-houses and these, like the commercial fishermen and their businesses, which are often family owned and operated in remote, isolated sections of coastline. Fish-houses and commercial fishermen have a symbiotic relationship, due to the seller/buyer economic need.

Credibility is crucial to gathering research in this population and a researcher is best served to listen to the words spoken by the commercial fishermen. A practical

observation regarding the fishermen and getting their participation revolves around the researcher having a mellow laid-back attitude. A researcher also needs to be aware enough to realize that when the fishermen are working, this is not the time to try to engage the fishermen in discussions related to research. When the boats are unloaded and clean, the fishermen are often hanging around the dock near the boats or at the local bar or restaurant in the area. At that point, they are relaxed and easier to approach concerning their participation in research.

The researcher should take the time to explain what the research concerns, why it is important, and what the need for the research is. It is important to communicate the need for the research and the value of the research to the fishermen and the fishing community. This must be explained in a simple, straightforward language at a high school level of communication. It should be made clear that the researcher is not conducting research that will affect them or their livelihood negatively.

The long-line fishermen and long-range purse seine net fishermen within the commercial fishing population are difficult to reach due to extended periods at sea. The long-line fishermen's participation in this study was low with only two long-line fishermen responding. It is unknown if any participants from the long range purse seine net fishery responded to the survey, this is due to not asking what specific method of net fishing they utilized. It is unlikely that this study included responses from this group, due to the surveys being collected during the period when they long-range boats are at sea fishing.

Chapter 5

Summary, Conclusions, Implications, and Recommendations

The purpose of this research was to identify the learning preferences of commercial fishermen in order to provide effective educational programs for commercial fishermen. This chapter includes a summary of the study, conclusions, implications, and recommendations for future research.

Summary of Study

This study surveyed 435 commercial fishermen across eight coastal regions of the United States where commercial fishing takes place. Participants were asked to complete the *Commercial Fishing Worker Survey* (CFWS), which consisted of an approved, modified version of the *Index of Learning Styles* Instrument (ILS) combined with a demographic section that included questions designed to obtain data regarding the four variables of the study: age, education level, captain's license status, and method of fishing. The instrument was designed to provide data sufficient to answer the three research questions of the study. The research questions are listed below

1. What are the learning preferences of commercial fishermen?
2. Are there differences in the learning preferences of commercial fishermen across the eight geographical regions of the study?
3. Are there differences in the learning preferences of commercial fishermen based on the demographic variables?

The variables were examined in relation to the data obtained from the modified ILS contained within the CFWS to determine any possible relationships or correlations that existed. The instrument succeeded in providing data sufficient to answer all research questions of the study and to build foundational knowledge regarding the learning preferences of commercial fishermen.

Conclusions

This research study was designed to determine if commercial fishermen exhibited specific learning preferences. The study reached the following conclusions.

1. Commercial fishermen showed obvious inclinations toward specific learning orientations
2. Commercial fishermen exhibited preferences within the inverse pairs. The commercial fishermen preferred the active (rather than the reflective) dimension, the sensing (rather than the intuitive) dimension, the visual (rather than the verbal), dimension, and the sequential (rather than the global) dimension. In non-technical language, they preferred to be actively involved, learn facts, remember what they see, and learn in a systematic progression.
3. The participant's responses were similar across the eight regions. Where differences existed, they were related to the sensing/intuitive and sequential/global learning preferences dimensions. Region 8 (Alaska) appeared to have stronger sensing and sequential learning preferences than the other regions.
4. Age did not appear to influence the learning preferences of the fishermen.

5. The majority of the respondents were high school graduates. The education levels of the respondents were higher than expected. However, education did not appear to affect the learning preferences of the commercial fishermen.
6. The majority of respondents did not possess a captain's license. Possession of a captain's license did not appear to have an influence on learning preference.
7. The largest percentage of the respondents was net fishermen. For the majority of participants, the method of fishing did not affect the learning preferences; however, the net and trap fishing methods exhibited differences in the sensing/intuitive and the sequential/global learning preference dimensions. Net fishermen appeared to have a higher preference for the sequential/global learning preference dimensions than the fishermen utilizing other commercial fishing methods

Implications

Implications for this study include the advancement of knowledge regarding the learning preferences of commercial fishermen. The identification of the commercial fishermen's learning preferences may allow for the development of enhanced curriculum designs and class offerings to best align with the fishermen's learning preferences. The knowledge regarding the fishermen's dimensional learning preferences should be considered when designing or implementing educational curriculums and programs targeted at commercial fishermen. The understanding of the fishermen's learning preferences may allow the instructor to design activities, which

align with those preferences. The design of learning programs aligned to the learner's dimensional preferences may enhance the effectiveness of future curricula. As all individual learners are different in regards to learning preferences, it is important that future curriculum development specialists and current instructors include activities incorporating instructional methods using all of the learning preference dimensions.

Incorporating learning activities that parallel dimensional preferences could reinforce information dissemination and understanding, while aiding in creating learning opportunities for any learner. Knowledge of the students and how they learn is important to creating learning opportunities for students. The ability to align learning activities with the learner's dimensional preferences could have important ramifications for the adult vocational education world, since vocational training could be aligned to the specific workforce being taught.

Since the commercial fishermen typically receive training and classes, which are vocational in nature, it is likely that this study's design could be used to determine the learning preferences of other worker populations. This may provide the basis for the creation of curricula targeted to the learning preferences of workers in their specific occupations. This could have a dramatic impact upon all areas of vocational training by providing learner-centered curricula aligned with the learners preferences.

The primary implication is that commercial fishermen as a worker group seem to share many similarities with construction workers, miners, farmers, and loggers as the commercial fishermen are often employed in these industries during offseason or closed fishing times. This could allow for vocational training/teaching opportunities, which could have a potential positive influence on the commercial fishermen.

Implications for the classroom environment. The consideration of the classroom environment is vital to the providing of learning opportunities, which enable the learner to participate directly in their learning. The classroom could contain props, visual or other items, which may allow indirect learning opportunities. The instructor could incorporate activities that are presented in a linear order with each step falling into place after the previous one. It is important for an instructor to do things in a linear manner without taking large steps at once or switching topics too quickly. Failure to consider a linear progression may create confusion for the learner who often needs more time to grasp a thorough understanding of the material before proceeding to the next topic.

The use of group or individual presentations; teach-back opportunities; online community learning; forums; and the use of diagrams, pictures, figures, or flowcharts to reinforce the spoken or written material being presented often creates substantially improved learning environments for learners. Most of the respondents to the *Index of Learning Styles* instrument over numerous studies have exhibited a learning preference for the visual dimension, yet there is often limited use of visual reference materials in classrooms. It is advisable to provide factual material and use hands-on tasks and conventional methods to solve problems. The task or activity should have real-world connections and have perceived value to the learner. It is vital to consider that even if the learners' preferences are known, the instructor should attempt to incorporate activities which span across all the learning preference dimensions.

Recommendations

There exists a breadth of possibilities for future research, the following recommendations are provided for future researchers to consider.

1. Since there are educational curricula currently in use for commercial fishing safety education, it is recommended that an in-depth evaluation using accepted evaluation techniques be conducted to determine the curricula alignment related to the learning preferences of the fishermen and the currently available curricula and courses offered to commercial fishermen. The evaluation could address the instructional delivery methods related to the learning preferences of commercial fishermen identified by this research. Additionally the curricula could be examined to determine the relevance and effectiveness of the content of the curricula about the effectiveness in meeting learning objectives for the particular curriculum. Finally, the evaluation could examine the retention level by the commercial fishermen related to the curriculum content, as this may be a leading indicator to ensure that the fishermen have a cognitive understanding of the curricula content.
2. Research could be conducted to examine the learning preferences of other high-risk workers to determine if similar or different patterns exist between these other industry workers and their learning preferences.
3. Subsequent research may provide information about the potential benefits or disadvantages of the use of vocational training/teaching opportunities for other high-risk occupations. Future research could be conducted into the fit of training programs across multiple occupations and any similarities between the workers.
4. Subsequent studies on commercial fishermen could expand on demographic information to include historical information related to their employment

- position on the vessel, why they choose to become commercial fishermen, years of experience in commercial fishing, or the extent of current safety training.
5. Additional research could expand on this research to seek answers regarding the self-directedness of commercial fishermen and other high-risk workers. Future research could seek to provide answers to the suitability and acceptance of hybrid or online education learning programs for critical safety education.
 6. This study also did not include many other variables for which age may have shown significance; these may include such things as technology use, distance education ability, and self-directed learning.
 7. Future research could investigate the reason that three regions in this study had higher education levels, which may be important.
 8. Another possible research option that may be appropriate is the generational concept of the commercial fishermen to examine any changes, which may be occurring due to the transitions of participation from one generation to another (i.e., are the fishermen a part of a multi-generational fishing operation?).
 9. Future research into the learning preferences of commercial fishermen could attempt to survey those involved in long-line fishing. This study had low respondent data from the long-line fishermen, they are a difficult segment of the population to reach due to the extended periods of time at sea spent by long-line fishermen. The long-line fishermen are often a transient fleet, often fishing from Nova Scotia to South America. Such a study could provide

- valuable information relevant to other workers who are isolated for long periods, such as oil exploration and oilrig workers who often are on the jobsite for extended time.
10. This research did not explore the societal aspect involved in commercial fishing and the potential role that the fishing communities play in regard to the learning preferences of the fishermen. This may be best accomplished by conducting studies within specific individual fishing communities in regards to their respective fisheries and their primary methods of fishing.
 11. Because local public schools are an integral part of the fishing community, schools may offer vocational programs or specific training related to aspects of the local commercial fishery. The schools may play an important role in establishing learner beliefs toward education, which could be investigated.
 12. Future research could explore the relationship of regulatory education vs voluntary educational opportunities. Commercial fishermen understand some of the dangers posed by their occupation and may respond better to specific safety education where the additional dangers in their occupation can be highlighted during training classes.
 13. Research could be conducted into whether the knowledge of additional dangers may increase the fishermen's voluntary participation in future educational activities. This may be important to understand the commercial fishermen's perceptions of the values or benefits related to training.

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Appendices

Appendix A

Illustrations of Commercial Fishing Methods

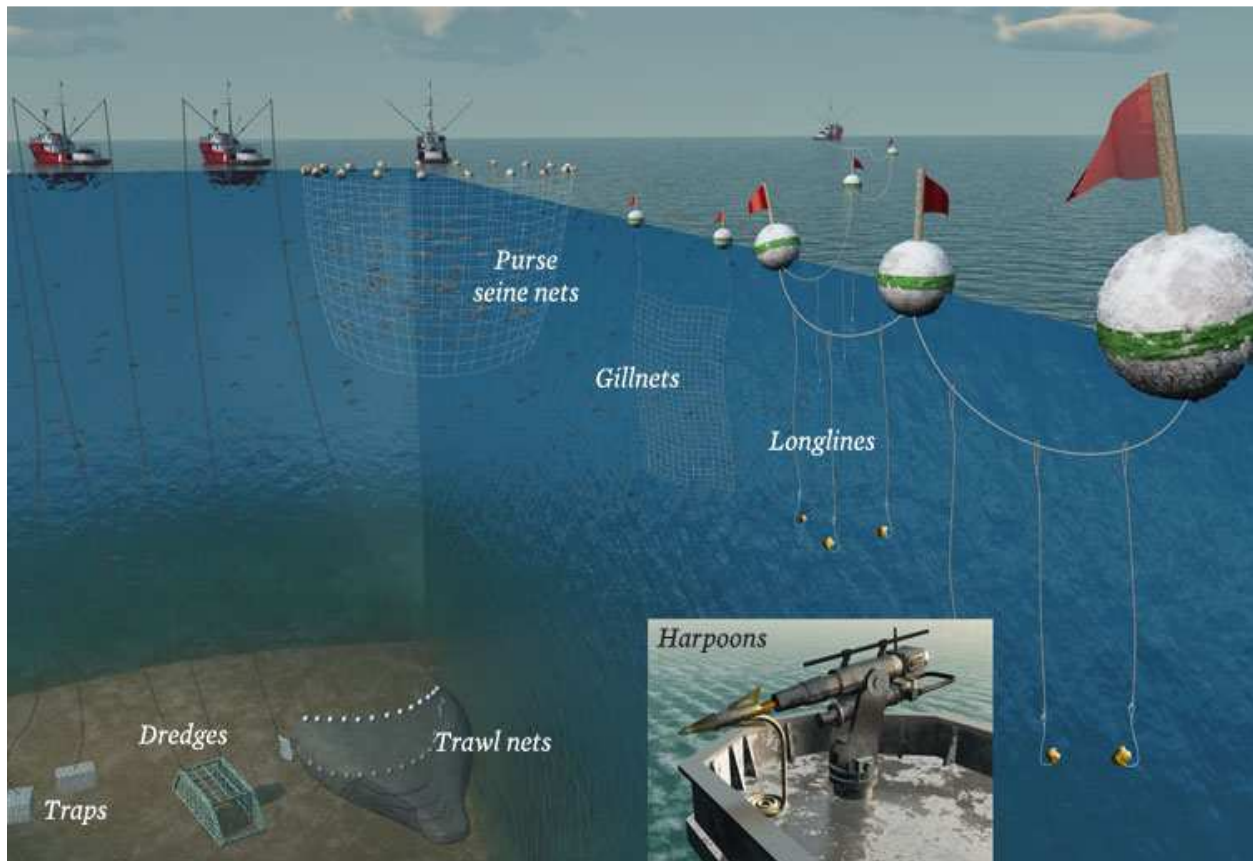


Figure A1. Various methods of commercial fishing. Illustration depicting various types of Harpoon, long-line, net, and trap methods of commercial fishing (harpoon fishing is only used in whale hunting and has been outlawed by international treaty). Japan is currently the only country that engages in harpoon fishing in its whaling industry.



Figure A2. Bandit fishing reel. Electric or hydraulic reel used in commercial fishing to target bottom dwelling fish, such as grouper and snapper. Illustration above shows an electric bandit reel rigged with a light stick to attract fish to the baits. Below the white light stick is a 12-foot wire leader with 4 to 10 baited hooks with a lead weight attached to the end of the leader to allow the baited hooks to remain on the bottom.

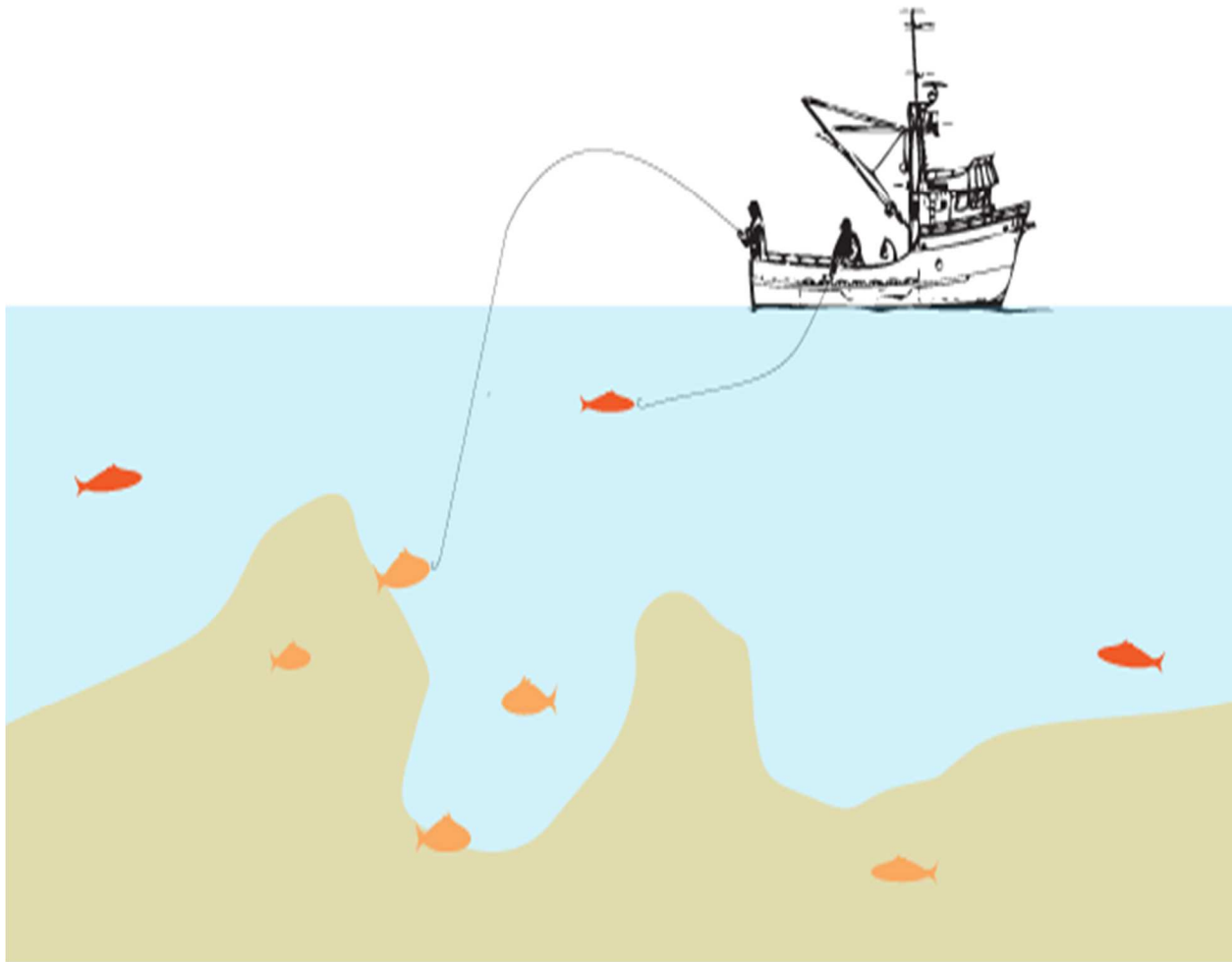


Figure A3. Conventional rod and reel method. This method uses a conventional hand-held rod and reel to target various fish species. This method may be used to target top and mid water species as well as bottom species.

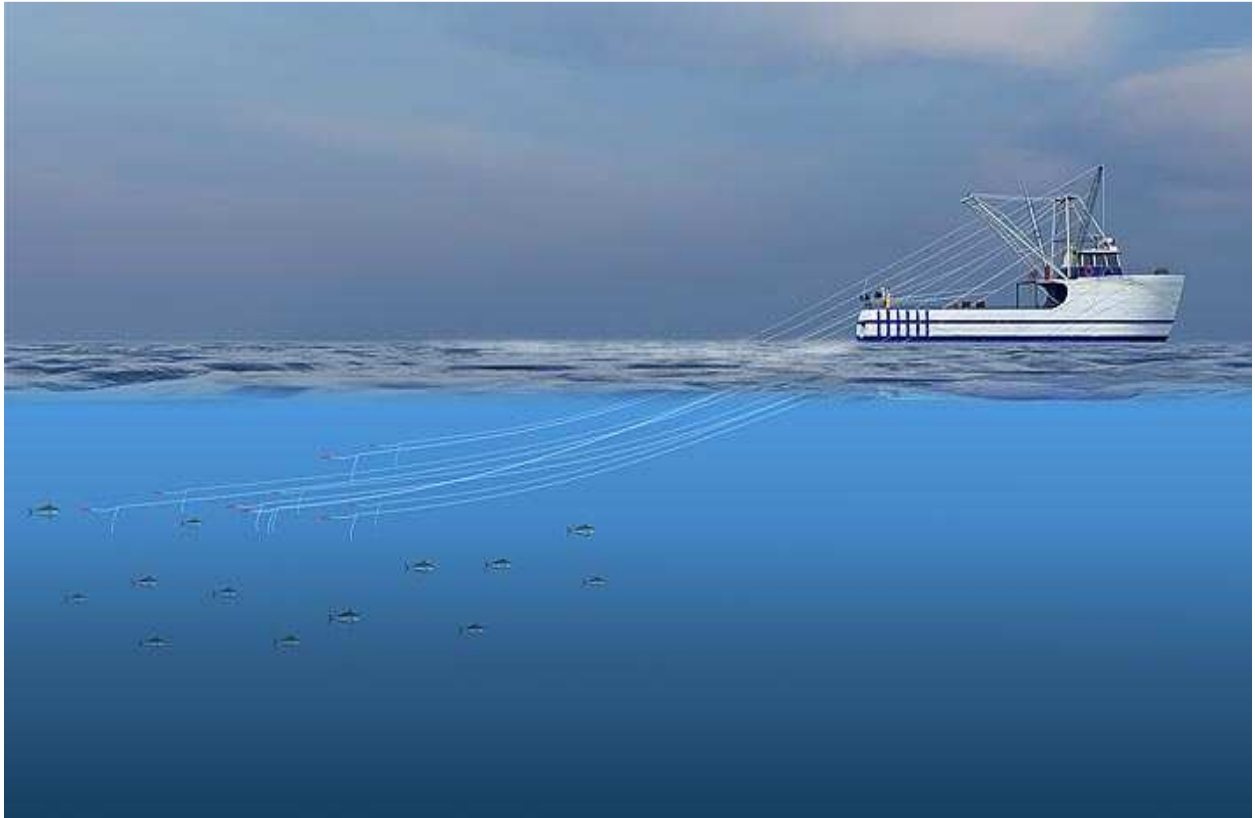


Figure A4. Trolling method of commercial fishing. Commercial fishing method using conventional rod and reels rigged with live, dead or artificial baits pulled behind the boat (trolling) to target pelagic species such as Tuna, Wahoo, and Mahi-Mahi.

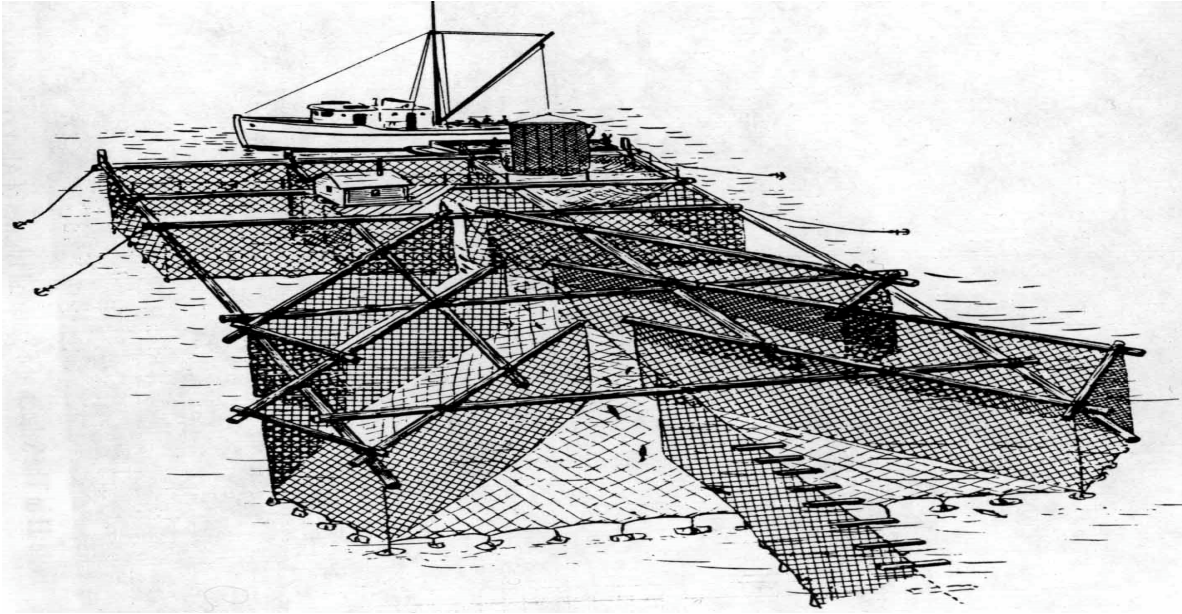


Figure A5. *Fish trap*. Typically used in rivers for migrating fish species such as steelhead and salmon.

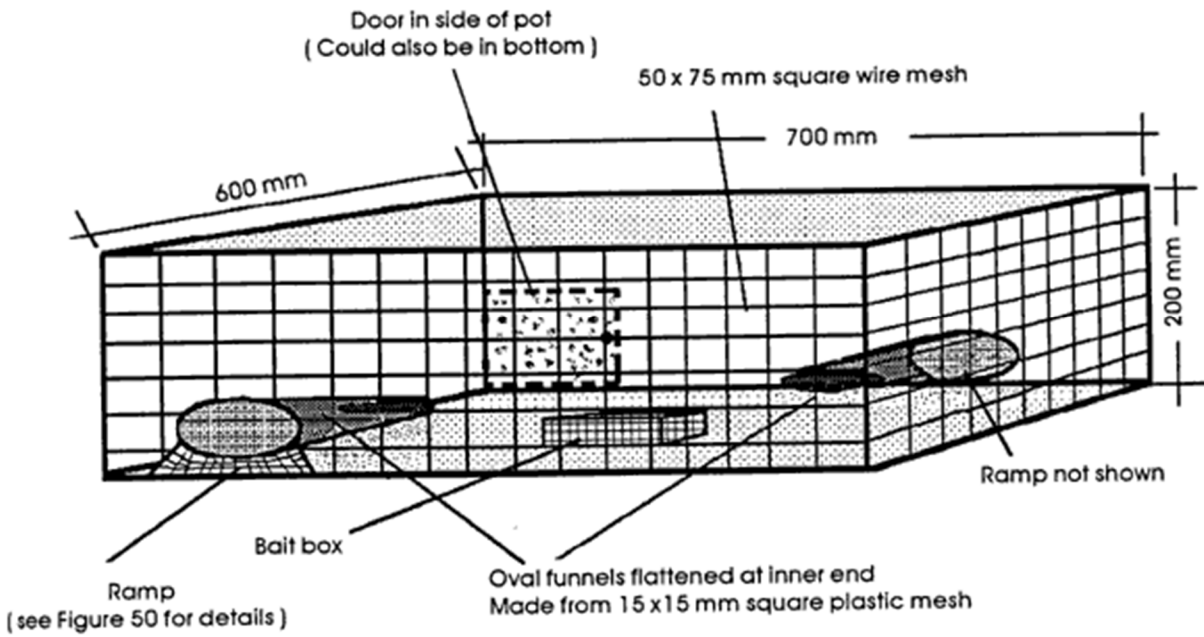


Figure A6. *Wire trap*. Used in crab, cod, and ling fishing.



Figure A7. Wood trap. Traditional wood trap used in lobster and crab fishing in multiple US commercial fishing regions.



Figure A8. Wood traps loaded on board a commercial fishing vessel. Typical view of crab/lobster commercial fishing vessel loaded prepared to leave port for a fishing trip.

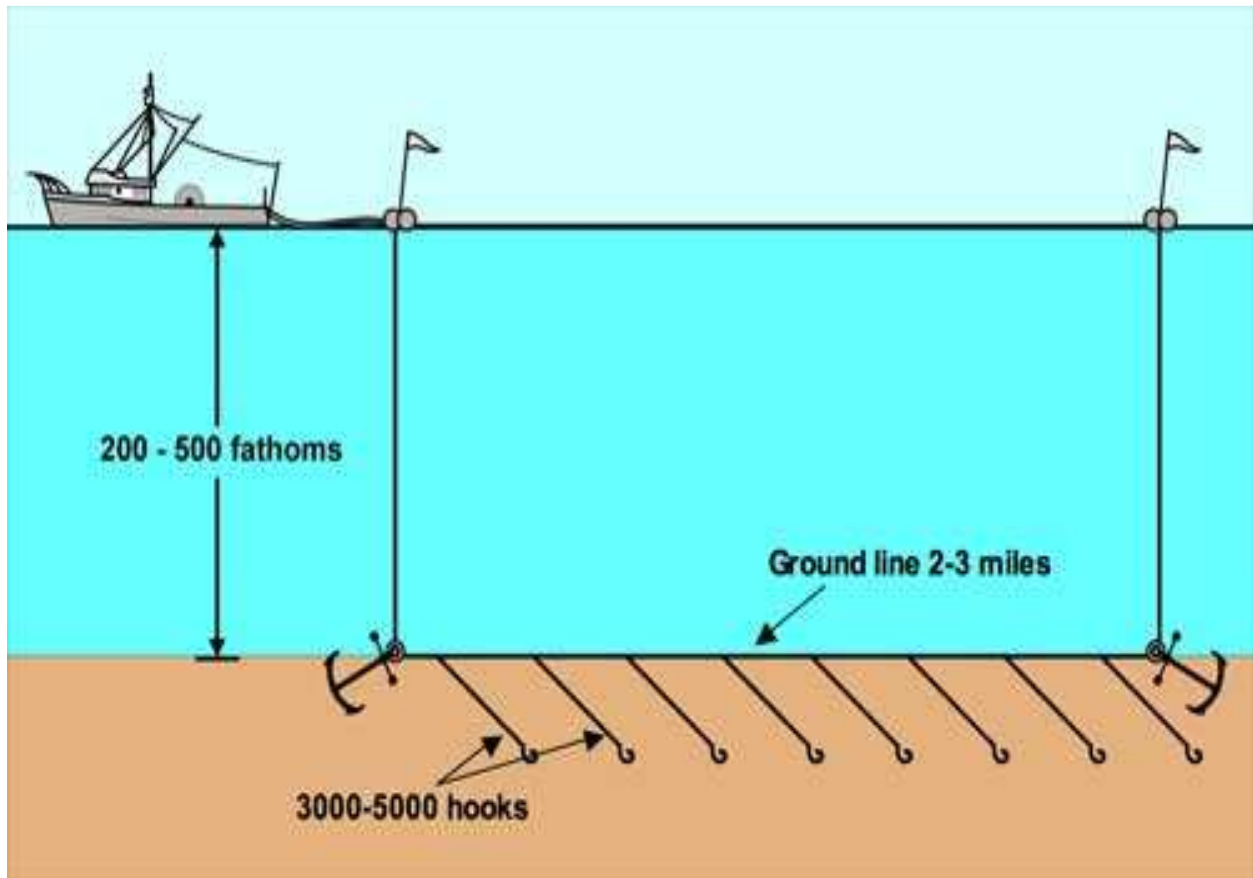


Figure A9. Long-line fishing. Common bottom set long-line method for commercial fishing of deep-water bottom species such as swordfish, tuna, and large snapper.

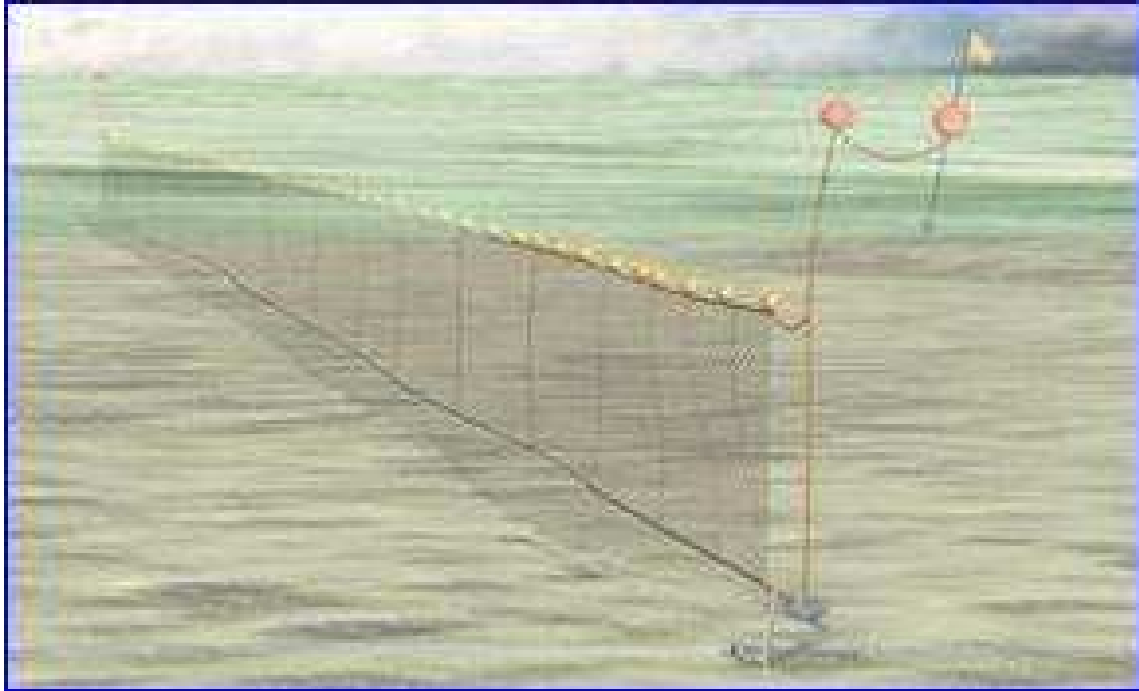


Figure A10. Bottom set gill net. Normally used to target baitfish or migratory species such as herring and salmon.

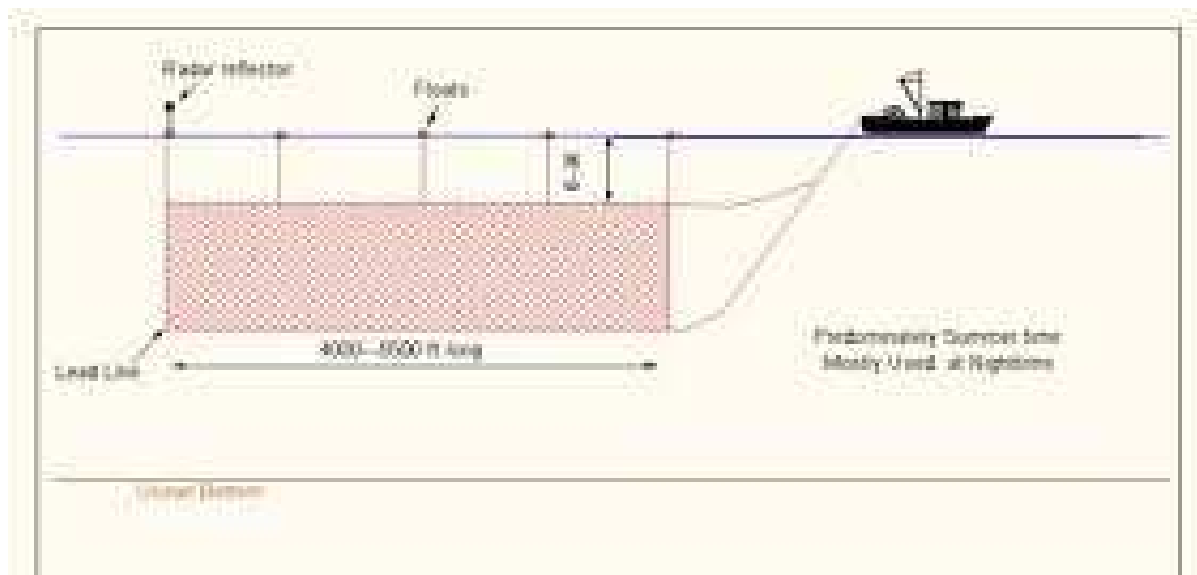


Figure A11. Drift gill net. This type of gill netting is often used in rivers and lakes to target trout and salmon.

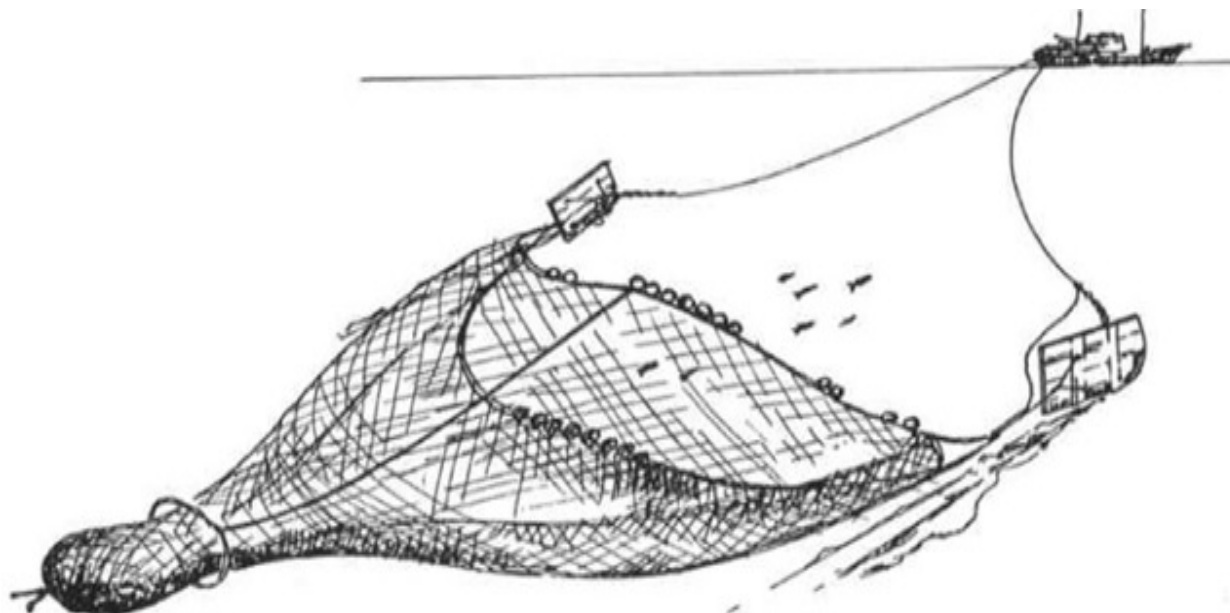


Figure A12. Common trawl net configuration. Primarily used for flounder, cod, and other bottom dwelling species with varying net mesh size according to species targeted.

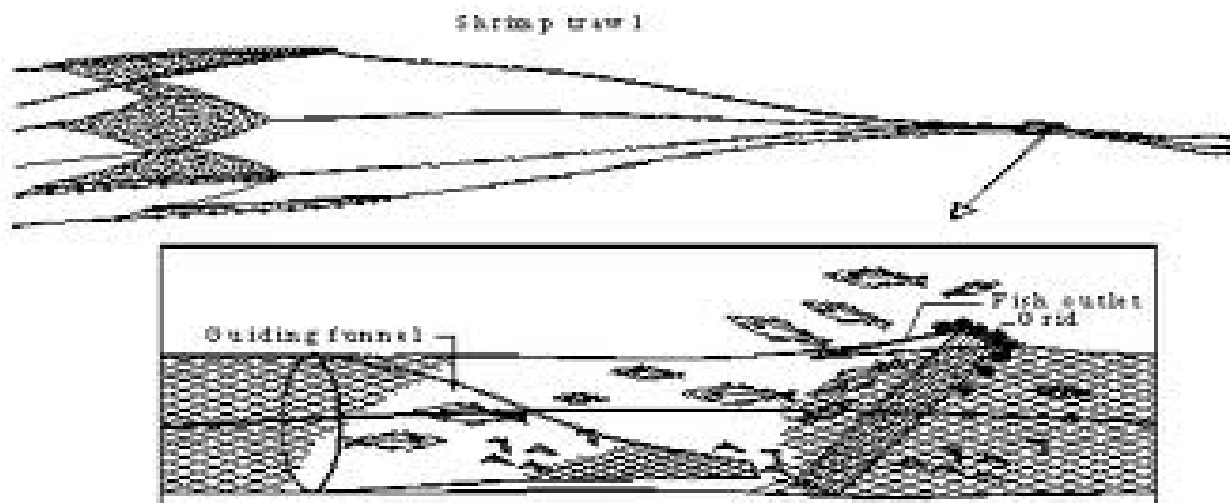


Figure A13. Shrimp trawl net. Shrimp trawls are equipped with fish excluders to allow large fish to escape without damaging the small mesh net size used for shrimp harvesting.



Figure A14. *Aerial view of purse seine net fishing.* Purse seining is normally used to encircle entire schools of pelagic species such as tuna.

Appendix B

Index of Learning Styles Instrument

- 1. I understand something better after I**
 - a) Try it out.
 - b) Think it through.
- 2. I would rather be considered**
 - a) Realistic.
 - b) Creative.
- 3. When I think about what I did yesterday, I am most likely to get**
 - a) A picture.
 - b) Words.
- 4. I tend to**
 - a) Understand the details, but fuzzy about the big picture
 - b) Understand the big picture, but fuzzy about details.
- 5. When I am learning something new, it helps me to**
 - a) Talk about it.
 - b) Think about it.
- 6. If I were a teacher, I would rather teach a course**
 - a) That deals with facts and real life situations.
 - b) That deals with ideas and theories.
- 7. I prefer to get new information in**
 - a) Pictures, diagrams, graphs, or maps.
 - b) Written directions or verbal information.

Appendix B (continued)

8. Once I understand

- a) All the parts, I understand the whole thing.
- b) The whole thing, I see how the parts fit.

9. Working in a group on a difficult problem, I am more likely to

- a) Jump in and contribute ideas.
- b) Sit back and listen.

10. I find it easier

- a) To learn facts.
- b) To learn concepts.

11. In a book with lots of pictures and charts, I am likely to

- a) Look over the pictures and charts carefully.
- b) Focus on the written text.

12. When I solve math problems

- a) I usually work the problem one step at a time.
- b) I often just see the answer, but then struggle to figure out the steps to get to the answer.

13. In classes I have taken

- a) I have usually gotten to know many of the students.
- b) I have rarely gotten to know many of the students.

14. In reading schoolbooks, owner's manuals, etc. I prefer

- a) Something that teaches me new facts or tells me how to do something.
- b) Something that gives me new ideas to think about.

15. I like teachers

- a) Who put a lot of diagrams on the board.
- b) Who spend a lot of time explaining.

Appendix B (continued)

- 16. When I am reading a story or a book**
- a) I think of the details and try to figure out the plot or story.
 - b) I know what the plot is when I finish reading, but then have to go back and find the details that explain it.
- 17. When I start a homework problem, I am more likely to**
- a) Start solving it immediately.
 - b) Think about it and then try to solve it.
- 18. I prefer the idea of**
- a) Facts.
 - b) Theories.
- 19. I remember best**
- a) What I see.
 - b) What I hear.
- 20. It is more important to me that an instructor**
- a) Lay out the material in clear steps.
 - b) Give me the big picture and how it relates to other things.
- 21. I prefer to study**
- a) In a group.
 - b) Alone.
- 22. I am more likely to be considered**
- a) Careful about of my work.
 - b) Creative about my work.
- 23. When I get directions to a new place, I prefer**
- a) A map.
 - b) Written instructions.

Appendix B (continued)

24. I learn

- a) At a fairly regular pace. If I study hard, I'll "get it."
- b) In fits and starts. I'll be totally confused and then suddenly it all "clicks."

25. I would rather first

- a) Try things out.
- b) Think about how I'm going to do it.

26. When I am reading for enjoyment, I like writers to

- a) Clearly say what they mean.
- b) Say things in creative, interesting ways.

27. When I see a diagram or sketch in class, I am most likely to remember

- a) The picture.
- b) What the instructor said about it.

28. When considering a body of information, I am more likely to

- a) Focus on details and miss the big picture.
- b) See the big picture before getting into the details.

29. I more easily remember

- a) Something I have done.
- b) Something I have thought a lot about.

30. When I have to perform a task, I prefer to

- a) Master one way of doing it.
- b) Come up with new ways of doing it.

31. When someone is showing me data, I prefer

- a) Charts or graphs.
- b) Text summarizing the results.

Appendix B (continued)

- 32. When writing a paper, I am more likely to**
- a) Write the beginning of the paper and progress forward
 - b) Write different parts of the paper and then put them in order
- 33. When I have to work on a group project, I first want to**
- a) Have a group discussion where everyone contributes ideas
 - b) Think about it individually and then come together as a group to compare ideas
- 34. I consider it higher praise to call someone**
- a) Sensible.
 - b) Imaginative.
- 35. When I meet people at a party, I am more likely to remember**
- a) What they looked like.
 - b) What they said about themselves.
- 36. When I am learning a new subject, I prefer to**
- a) Stay focused on that subject, learning as much about it as I can.
 - b) To make connections between that subject and other subjects.
- 37. I am more likely to be considered**
- a) Outgoing.
 - b) Reserved.
- 38. I prefer classes that emphasize**
- a) Facts, data.
 - b) Concepts, theories.
- 39. For entertainment, I would rather**
- a) Watch television.
 - b) Read a book.

Appendix B (continued)

- 40. Some teachers start their lectures with an outline (what they are going to teach or what they will cover). Such outlines are**
- a) Somewhat helpful to me.
 - b) Very helpful to me.
- 41. The idea of working in groups**
- a) Appeals to me.
 - b) Does not appeal to me.
- 42. When I am doing math problems,**
- a) I check all my steps and check my work carefully.
 - b) I don't like to check my work and have to force myself to do it.
- 43. I tend to picture places I have been**
- a) Easily and fairly accurately.
 - b) With difficulty and without much detail.
- 44. When solving problems in a group, I would be more likely to**
- a) Think of the steps in solving the problem.
 - b) Think of what other issues the solution may cause and also how the solution may help solve other problems.

Appendix C

Demographic Survey

45. How old are you? _____

47. What is your current education level?

Did not complete High school

High school/ GED

Some college

Associates degree

Bachelors' degree

Graduate degree

Other (Please specify) _____

49. Do you currently hold a Captains License?

Yes

No

50. What method of fishing do you normally work with?

Net

Long line

Trap/Pot

Rod/reel/bandit deep drop

Other Please specify) _____

51. In which U.S region do you fish?

Regions are described below: Please check all that apply.

Northeast Atlantic region: the Atlantic coastal areas north of Cape May, New Jersey to the Canadian border.

Mid-Atlantic region: the Atlantic coastal areas south of Cape May New Jersey to the South Carolina state line.

Appendix C (continued)

- Southeast Atlantic region:** the Atlantic coastal areas south of the South Carolina state line to Key West Florida.
- Gulf coast region:** the coastal Gulf of Mexico areas north of Key West Florida extending north and west to the Texas border and continuing south to the Mexico border.
- Great Lakes region** defined as the United States territorial waters of the Great Lakes. The region of the lakes beginning on the shorelines of those states bordering the five great lakes to the United States-Canadian border
- Southern Pacific region** defined at the Pacific coastal waters beginning at the United States–Mexico boundary extending northward to the California-Oregon border
- Pacific Northwest region** defined as the coastal areas beginning at the California –Oregon border extending northward to the to the United States-Canadian border
- Alaska region** defined as the coastal waters of Alaska beginning at the United States- Canadian boundary and continuing westward and northward to include all coastal waters all related bays and fiords which are geographically known to represent all the coastal area waters of Alaska culminating at the Arctic Ocean in Barrow, Alaska.

Appendix D

Instrument Scoring

ILS SCORING SHEET

- Put "1"s in the appropriate spaces in the table below (e.g. if you answered "a" to Question 3, put a "1" in Column A by Question 3).
- Total the columns and write the totals in the indicated spaces.
- For each of the four scales, subtract the smaller total from the larger one. Write the difference (1 to 11) and the letter (a or b) for which the total was larger on the bottom line.

For example, if under "ACT/REF" you had 4 "a" and 7 "b" responses, you would write "3b" on the bottom line under that heading..

- On the next page, mark "X"s above your scores on each of the four scales.

ACT/REF			SNS/INT			VIS/VRB			SEQ/GLO		
Q	a	b	Q	a	b	Q	a	b	Q	a	b
1	___	___	2	___	___	3	___	___	4	___	___
5	___	___	6	___	___	7	___	___	8	___	___
9	___	___	10	___	___	11	___	___	12	___	___
13	___	___	14	___	___	15	___	___	16	___	___
17	___	___	18	___	___	19	___	___	20	___	___
21	___	___	22	___	___	23	___	___	24	___	___
25	___	___	26	___	___	27	___	___	28	___	___
29	___	___	30	___	___	31	___	___	32	___	___
33	___	___	34	___	___	35	___	___	36	___	___
37	___	___	38	___	___	39	___	___	40	___	___
41	___	___	42	___	___	43	___	___	44	___	___
Total (sum X's in each column)											
ACT/REF			SNS/INT			VIS/VRB			SEQ/GLO		
a	b		a	b		a	b		a	b	
___	___		___	___		___	___		___	___	
(Larger - Smaller) + Letter of Larger (see below*)											
___	___		___	___		___	___		___	___	

*Example: If you totaled 3 for a and 8 for b, you would enter 5b in the space below.

Transfer your scores to the ILS report form by placing X's at the appropriate locations on the four scales.

ILS REPORT FORM

ACT	11a	9a	7a	5a	3a	1a		1b	3b	5b	7b	9b	11b	REF
SEN	11a	9a	7a	5a	3a	1a		1b	3b	5b	7b	9b	11b	INT
VIS	11a	9a	7a	5a	3a	1a		1b	3b	5b	7b	9b	11b	VRB
SEQ	11a	9a	7a	5a	3a	1a		1b	3b	5b	7b	9b	11b	GLO

If your score on a scale is 1-3, you are fairly well balanced on the two dimensions of that scale.

If your score on a scale is 5 or 7, you have a moderate preference for one dimension of the scale and will learn more easily in a teaching environment which favors that dimension.

If your score on a scale is 9 or 11, you have a very strong preference for one dimension of the scale. You may have real difficulty learning in an environment which does not support that preference.

See "Learning Styles and Strategies" by Richard Felder and Barbara Soloman for explanations of your preferences on the individual scales.

Appendix E

Description of the *Index of Learning Styles* Instrument

LEARNING STYLES AND STRATEGIES¹

Richard M. Felder
Hoechst Celanese Professor of Chemical Engineering
North Carolina State University

Barbara A. Soloman
Coordinator of Advising, First Year College
North Carolina State University

ACTIVE AND REFLECTIVE LEARNERS²

- Active learners tend to retain and understand information best by doing something active with it—discussing or applying it or explaining it to others. Reflective learners prefer to think about it quietly first.
- “Let’s try it out and see how it works” is an active learner’s phrase; “Let’s think it through first” is the reflective learner’s response.
- Active learners tend to like group work more than reflective learners, who prefer working alone.
- Sitting through lectures without getting to do anything physical but take notes is hard for both learning types, but particularly hard for active learners.

Everybody is active sometimes and reflective sometimes. Your preference for one category or the other may be strong, moderate, or mild. A balance of the two is desirable. If you always act before reflecting you can jump into things prematurely and get into trouble, while if you spend too much time reflecting you may never get anything done.

How can active learners help themselves?

If you are an active learner in a class that allows little or no class time for discussion or problem-solving activities, you should try to compensate for these lacks when you study. Study in a group in which the members take turns explaining different topics to each other. Work with others to guess what you will be asked on the next test and figure out how you will answer. You will always retain information better if you find ways to do something with it.

How can reflective learners help themselves?

If you are a reflective learner in a class that allows little or not class time for thinking about new information, you should try to compensate for this lack when you study. Don’t simply read or memorize the material; stop periodically to review what you have read and to think of possible questions or applications. You might find it helpful to write short summaries of readings or class notes in your own words. Doing so may take extra time but will enable you to retain the material more effectively.

SENSING AND INTUITIVE LEARNERS³

- Sensing learners tend to like learning facts, intuitive learners often prefer discovering possibilities and relationships.
- Sensors often like solving problems by well-established methods and dislike complications and surprises; intuitors like innovation and dislike repetition. Sensors are more likely than intuitors to resent being tested on material that has not been explicitly covered in class.
- Sensors tend to be patient with details and good at memorizing facts and doing hands-on (laboratory) work; intuitors may be better at grasping new concepts and are often more comfortable than sensors with abstractions and mathematical formulations.
- Sensors tend to be more practical and careful than intuitors; intuitors tend to work faster and to be more innovative than sensors.
- Sensors don't like courses that have no apparent connection to the real world; intuitors don't like "plug-and-chug" courses that involve a lot of memorization and routine calculations.

Everybody is sensing sometimes and intuitive sometimes. Your preference for one or the other may be strong, moderate, or mild. To be effective as a learner and problem solver, you need to be able to function both ways. If you overemphasize intuition, you may miss important details or make careless mistakes in calculations or hands-on work; if you overemphasize sensing, you may rely too much on memorization and familiar methods and not concentrate enough on understanding and innovative thinking.

How can sensing learners help themselves?

Sensors remember and understand information best if they can see how it connects to the real world. If you are in a class where most of the material is abstract and theoretical, you may have difficulty. Ask your instructor for specific examples of concepts and procedures, and find out how the concepts apply in practice. If the teacher does not provide enough specifics, try to find some in your course text or other references or by brainstorming with friends or classmates.

How can intuitive learners help themselves?

Many college lecture classes are aimed at intuitors. However, if you are an intuitor and you happen to be in a class that deals primarily with memorization and rote substitution in formulas, you may have trouble with boredom. Ask your instructor for interpretations or theories that link the facts, or try to find the connections yourself. You may also be prone to careless mistakes on test because you are impatient with details and don't like repetition (as in checking your completed solutions). Take time to read the entire question before you start answering and be sure to check your results.

VISUAL AND VERBAL LEARNERS

Visual learners remember best what they see—pictures, diagrams, flow charts, time lines, films, and demonstrations. Verbal learners get more out of words—written and spoken explanations. Everyone learns more when information is presented both visually and verbally.

In most college classes very little visual information is presented: students mainly listen to lectures and read material written on chalkboards and in textbooks and handouts.

Unfortunately, most people are visual learners, which means that most students do not get nearly as much as they would if more visual presentation were used in class. Good learners are capable of processing information presented either visually or verbally.

How can visual learners help themselves?

If you are a visual learner, try to find diagrams, sketches, schematics, photographs, flow charts, or any other visual representation of course material that is predominantly verbal. Ask your instructor, consult reference books, and see if any videotapes or CD-ROM displays of the course material are available. Prepare a concept map by listing key points, enclosing them in boxes or circles, and drawing lines with arrows between concepts to show connections. Color-code your notes with a highlighter so that everything relating to one topic is the same color.

How can verbal learners help themselves?

Write summaries or outlines of course material in your own words. Working in groups can be particularly effective: you gain understanding of material by hearing classmates' explanations and you learn even more when you do the explaining.

SEQUENTIAL AND GLOBAL LEARNERS⁴

- Sequential learners tend to gain understanding in linear steps, with each step following logically from the previous one. Global learners tend to learn in large jumps, absorbing material almost randomly without seeing connections, and then suddenly "getting it."
- Sequential learners tend to follow logical stepwise paths in finding solutions; global learners may be able to solve complex problems quickly or put things together in novel ways once they have grasped the big picture, but they may have difficulty explaining how they did it.

Many people who read this description may conclude incorrectly that they are global, since everyone has experienced bewilderment followed by a sudden flash of understanding. What makes you global or not is what happens before the light bulb goes on. Sequential learners may not fully understand the material but they can nevertheless do something with it (like solve the homework problems or pass the test) since the pieces they have absorbed are logically connected. Strongly global learners who lack good sequential thinking abilities, on the other hand, may have serious difficulties until they have the big picture. Even after they have it, they may be fuzzy about the details of the subject, while sequential learners may know a lot about specific aspects of a subject but may have trouble relating them to different aspects of the same subject or to different subjects.

How can sequential learners help themselves?

Most college courses are taught in a sequential manner. However, if you are a sequential learner and you have an instructor who jumps around from topic to topic or skips steps, you may have difficulty following and remembering. Ask the instructor to fill in the skipped steps, or fill them in yourself by consulting references. When you are studying, take the time to outline the lecture material for yourself in logical order. In the long run doing so will save you time. You might also try to strengthen your global thinking skills by relating each new topic you study to things you already know. The more you can do so, the deeper your understanding of the topic is likely to be.

How can global learners help themselves?

If you are a global learner, just recognizing that you aren't slow or stupid but simply function differently from most of your classmates can help a great deal.¹ However, there are some steps you can take that may help you get the big picture more quickly. Before you begin to study the first section of a chapter in a text, skim through the entire chapter to get an overview. Doing so may be time-consuming initially but it may save you from going over and over individual parts later. Instead of spending a short time on every subject every night, you might find it more productive to immerse yourself in individual subjects for large blocks. Try to relate the subject to things you already know, either by asking the instructor to help you see connections or by consulting references. Above all, don't lose faith in yourself; you will eventually understand the new material, and once you do your understanding of how it connects to other topics and disciplines may enable you to apply it in ways that most sequential thinkers would never dream of.

¹Copyright ©1993 by Richard M. Felder and Barbara A. Soloman. Based on material in R.M. Felder and L.K. Silverman, "Learning and Teaching Styles in Engineering Education," *Engr. Education*, 78(7), 674-681 (1988), <<http://www.ncsu.edu/felder-public/Papers/LS-1988.pdf>>.

²See R.M. Felder, "Meet Your Students: S. Edward and Irving," *Chemical Engineering Education*, Winter 1994, pp. 36-37, <<http://www.ncsu.edu/felder-public/Columns/Edirv.html>>. Edward is an extravert and Irving is an introvert, types related to active and reflective learners although not identical to them.

Appendix F
Correspondence with R. Felder, Ph.D.
ILS wording changes

Dr. Felder,

As per our previous discussion regarding my use of the ILS with a population of commercial fishermen, I have made changes to the terminology to allow for increased understanding and clarity of terms for the fishermen. I feel that many of the terms are outside of the vocabulary of the fishermen.

Would you please review and offer any suggestions or concerns relating to my changes to the terms used in the ILS.

Please feel free to contact me at any time via email or phone (704) 400-1879 or marinesafety@hotmail.com

Sincerely,

Robert Miller
Doctoral Candidate
Adult Education
College of Education
University of South Florida

Saturday, February 1, 2014 at 12:57:48 PM Eastern Standard Time

Subject: Re: Changes in ILS for use in commercial fishermen

Date: Thursday, January 9, 2014 at 2:32:11 PM Eastern Standard Time

From: Robert Miller

To: Richard Felder

Dr Felder,

Thank you for your prompt reply,

I will work on 16 and 44 with my major professor Dr James tonight and I will return it to you for review asap. It is my utmost concern to ensure that you are happy with my use of your instrument.

Sincerely

Robert

From: Richard Felder <felder@ncsu.edu>

Date: Thursday, January 9, 2014 1:27 PM

To: Robert Miller <safety-solutions@hotmail.com>

Subject: Re: Changes in ILS for use in commercial fishermen

Robert,

Question 16 doesn't work. In (a), "I think of who and what happened" makes no sense (literally, you're saying "I think of who happened"), and if you know what happened there's nothing to figure out. (b) is not as bad grammatically but it doesn't make sense in the context of learning styles.

The change in 44(b) loses the meaning of the original.

RF

On Thu, Jan 9, 2014 at 12:34 PM, Safety Training Consultation Services <safety-solutions@hotmail.com> wrote:
Dr. Felder,

Would you please review the attachment and offer concerns or recommendations concerning wording changes to the ILS

Thank you

Robert Miller
Doctoral Candidate
University of South Florida

Appendix F (continued)

Saturday, February 1, 2014 at 12:55:07 PM Eastern Standard Time

Subject: Re: Fwd: Instrument revision
Date: Saturday, February 1, 2014 at 11:57:01 AM Eastern Standard Time
From: Richard Felder
To: safety-solutions@hotmail.com

Hi Robert,

The questions look fine to me. You're welcome to include our correspondence.

I don't need the instrument results, but I'd enjoy looking at whatever you write regarding them.

Cordially,

Richard Felder
Hoechst Celanese Professor Emeritus of Chemical Engineering
North Carolina State University
www.ncsu.edu/effective_teaching

----- Forwarded message -----

From: **Safety Training Consultation Services** <safety-solutions@hotmail.com>
Date: Wed, Jan 29, 2014 at 10:02 AM
Subject: Instrument revision
To: felder@ncsu.edu
Cc: Robert Miller <marinesafety@hotmail.com>

Good morning Dr. Felder,

I have made corrections to question #s 16 and 44 on the ILS as per our earlier correspondence.

Could you please review my changes and offer thoughts or critiques?

May I also ask your permission to include our correspondence in the appendices of my work ?

If the changes meet your approval, I will soon be conducting a cognitive interview pilot using a small sample of my population.

I will be happy send you all instrument results once complete, if you would like them.

Thank you

Robert Miller
Doctorate Candidate
University of South Florida
College of Education
Adult, Career and Higher Education Department (CNI)
4202 E. Fowler Avenue
Tampa FL 33620

Page 1 of 2

APPENDIX G

The Commercial Fishing Worker Survey

Commercial Fishing Worker Survey

Instructor Instructions

Dear Instructor,

This study will be used to enhance current classes and help develop future classes for commercial fishermen

Please follow the directions below:

1. Read the instructors instructions before removing participant packets.
2. Do not distribute participant packets until the end of the EDC course.
3. Ask all EDC course participants to please participate in the study.
4. Inform all potential participants that the survey is voluntarily and in no way affects their successful completion of the EDC course.
5. Designate a specific location for participants to leave participant packages.
6. Ask all participants to leave at the designated spot.
7. Thank all participants for their participation.
8. Place instructors return address with state of EDC course location on the pre-addressed return envelope.
9. Place participant packets into the pre-addressed return envelope and return to:

Robert Miller
11102 N Dixon Ave.
Tampa Florida 33612
(704) 400-1879

<mailto:marinesafety@hotmail.com>

Thank you for assisting in this study

Commercial Fishing Worker Survey

Informed consent

PARTICIPATION IN THIS SURVEY IS 100% VOLUNTARY AND YOUR DECISION TO PARTICIPATE WILL NOT AFFECT THE CLASS YOU ARE ATTENDING

- This research is using the Commercial Fishing Worker Survey to collect data for a research study named “Learning Preferences of Commercial Fishermen”.
- This survey is being used as research to gather information on how commercial fishermen learn.
- It is expected that completing this survey will take less than 15 minutes and poses no foreseeable risk to participants.
- This study will be used to enhance current commercial fishing safety classes and will help to develop future classes for commercial fishermen
- All information collected is anonymous and confidential and will not be shared with anyone outside of the research team. Results of the study may be published at a future date, but will contain no identifiable information regarding study participants.

For further information regarding this study, or to request a copy of the final report upon the study’s conclusion. Please contact marinesafety@hotmail.com or (704) 400-1879 or contact the USF Institutional Review Board at rsch-arc@usf.edu or (813) 974-2880 and provide study number Pro00015234

Commercial Fishing Worker Survey

PARTICIPATION IN THIS SURVEY IS 100%
VOLUNTARY

**If you choose not to participate in this study, please
proceed to Step 2.**

Instructions

Step 1.

- a. Please do not write your name, or any identifying information on the survey.
- b. Please answer every question in the survey.
- c. Please circle only one answer per question.

Step 2.

- a. Place survey back into envelope.
- b. Close the envelope.
- c. Leave envelope at the designated location identified by the instructor.

Appendix G (continued)

- 1. I understand something better after I**
 - a) Try it out.
 - b) Think it through.
- 2. I would rather be considered**
 - a) Realistic.
 - b) Creative.
- 3. When I think about what I did yesterday, I am most likely to get**
 - a) A picture.
 - b) Words.
- 4. I tend to**
 - a) Understand the details, but fuzzy about the big picture
 - b) Understand the big picture, but fuzzy about details.
- 5. When I am learning something new, it helps me to**
 - a) Talk about it.
 - b) Think about it.
- 6. If I were a teacher, I would rather teach a course**
 - a) That deals with facts and real life situations.
 - b) That deals with ideas and theories.
- 7. I prefer to get new information in**
 - a) Pictures, diagrams, graphs, or maps.
 - b) Written directions or verbal information.
- 8. Once I understand**
 - a) All the parts, I understand the whole thing.
 - b) The whole thing, I see how the parts fit.

Appendix G (continued)

- 9. Working in a group on a difficult problem, I am more likely to**
- a) Jump in and contribute ideas.
 - b) Sit back and listen.
- 10. I find it easier**
- a) To learn facts.
 - b) To learn concepts.
- 11. In a book with lots of pictures and charts, I am likely to**
- a) Look over the pictures and charts carefully.
 - b) Focus on the written text.
- 12. When I solve math problems**
- c) I usually work the problem one step at a time.
 - d) I often just see the answer, but then struggle to figure out the steps to get to the answer.
- 13. In classes I have taken**
- a) I have usually gotten to know many of the students.
 - b) I have rarely gotten to know many of the students.
- 14. In reading schoolbooks, owner's manuals, etc. I prefer**
- a) Something that teaches me new facts or tells me how to do something.
 - b) Something that gives me new ideas to think about.
- 15. I like teachers**
- a) Who put a lot of diagrams on the board?
 - b) Who spend a lot of time explaining?
- 16. When I'm reading a story or a book**
- a) I think of the details and try to figure out the plot or story.
 - b) I know what the plot is when I finish reading, but then have to go back and find the details that explain it.

Appendix G (continued)

- 17. When I start a homework problem, I am more likely to**
- a) Start solving it immediately.
 - b) Think about it and then try to solve it.
- 18. I prefer the idea of**
- a) Facts.
 - b) Theories.
- 19. I remember best**
- a) What I see.
 - b) What I hear.
- 20. It is more important to me that an instructor**
- a) Lays out the material in clear steps.
 - b) Gives me the big picture and how it relates to other things.
- 21. I prefer to study**
- a) In a group.
 - b) Alone.
- 22. I am more likely to be considered**
- a) Careful about my work.
 - b) Creative about my work.
- 23. When I get directions to a new place, I prefer**
- a) A map.
 - b) Written instructions.
- 24. I learn**
- a) At a fairly regular pace. If I study hard, I'll "get it."
 - b) In fits and starts. I'll be totally confused and then suddenly it all "clicks."

Appendix G (continued)

- 25. I would rather first**
- a) Try things out.
 - b) Think about how I'm going to do it.
- 26. When I am reading for enjoyment, I like writers to**
- a) Clearly say what they mean.
 - b) Say things in creative, interesting ways.
- 27. When I see a diagram or sketch in class, I am most likely to remember**
- a) The picture.
 - b) What the instructor said about it.
- 28. When considering a body of information, I am more likely to**
- a) Focus on details and miss the big picture.
 - b) See the big picture before getting into the details.
- 29. I more easily remember**
- a) Something I have done.
 - b) Something I have thought a lot about.
- 30. When I have to perform a task, I prefer to**
- a) Master one way of doing it.
 - b) Come up with new ways of doing it.
- 31. When someone is showing me data, I prefer**
- a) Charts or graphs.
 - b) Text summarizing the results.
- 32. When writing a paper, I am more likely to**
- a) Write the beginning of the paper and progress forward.
 - b) Write different parts of the paper and then put them in order.

Appendix G (continued)

- 33. When I have to work on a group project, I first want to**
- b) Have a group discussion where everyone contributes ideas
 - b) Think about it individually and then come together as a group to compare ideas
- 34. I consider it higher praise to call someone**
- a) Sensible.
 - b) Imaginative.
- 35. When I meet people at a party, I am more likely to remember**
- c) What they looked like.
 - d) What they said about themselves.
- 36. When I am learning a new subject, I prefer to**
- a) Stay focused on that subject, learning as much about it as I can.
 - b) To make connections between that subject and other subjects.
- 37. I am more likely to be considered**
- a) Outgoing.
 - b) Reserved.
- 38. I prefer classes that emphasize**
- a) Facts, data.
 - b) Concepts, theories.
- 39. For entertainment, I would rather**
- a) Watch television.
 - b) Read a book.
- 40. Some teachers start their lectures with an outline (what they are going to teach or what they will cover). Such outlines are**
- a) Somewhat helpful to me.
 - b) Very helpful to me.

Appendix G (continued)

41. The idea of working in groups

- a) Appeals to me.
- b) Does not appeal to me.

42. When I am doing math problems,

- a) I check all my steps and check my work carefully.
- b) I don't like to check my work and have to force myself to do it.

43. I tend to picture places I have been

- a) Easily and fairly accurately.
- b) With difficulty and without much detail.

44. When solving problems in a group, I would be more likely to

- c) Think of the steps in solving the problem.
- d) Think of how the solution may cause issues in solving the problem and also how the solution may help solve other problems.

45. How old are you? _____

46. What is your current education level?

Did not complete High school

High school/ GED

Some college

Associates degree

Bachelors' degree

Graduate degree

Other (Please specify) _____

47. Do you currently hold a USCG Captain's license?

Yes

No

Appendix G (continued)

48. What method of fishing do you normally work with?

Net.

Long line.

Trap/Pot.

Bottom (i.e. Rod and reel/ bandit, deep drop)

Other. (Please specify) _____

49. In which U.S. region do you normally fish? Please circle the region.

Northeast Atlantic defined as the Atlantic coastal areas beginning at the United States-Canada border in Maine extending southward to Cape May, New Jersey.

Mid-Atlantic defined as the Atlantic coastal areas beginning at Cape May, New Jersey and extending southward to the North Carolina-South Carolina state border.

Southeast Atlantic defined as the Atlantic coastal areas beginning at the North Carolina-South Carolina border and extending southward to Key West, Florida.

Gulf of Mexico defined as the coastal Gulf of Mexico areas beginning in Key West, Florida, and extending north and west along the coastal region of Florida, continuing westward along the coastal Gulf of Mexico areas to the Texas border, and continues southward along the Texas coast ending at the United States-Mexico border.

Great Lakes defined as the United States territorial waters of the Great Lakes. The region begins on the shorelines of those states bordering the five Great Lakes to the United States-Canada border.

Southern Pacific defined at the Pacific coastal waters beginning at the United States-Mexico boundary extending northward to the California-Oregon border.

Pacific Northwest defined as the coastal areas beginning at the California-Oregon border extending northward to the United States-Canada border.

Alaska region

defined as the coastal waters of Alaska beginning at the United States-Canada boundary and continuing westward and northward to include all coastal waters all related bays and fiords which are geographically known to represent all the coastal area waters of Alaska culminating at the Arctic Ocean in Barrow, Alaska.

APPENDIX H

Alaska Marine Safety Educators Association (AMSEA) Letter of Research Support



Alaska Marine Safety Education Association

2924 Halibut Point Road, Sitka, Alaska 99835-9668
Voice: 907-747-3287 Fax: 907-747-3259 www.amsea.org

Date: February 6, 2014
TO: IRB Board
FROM: Jerry Dzugan, Director
REGARDING: Dissertation proposal by Robert Miller

The Alaska Marine Safety Education Association (AMSEA) has conducted training with over 200,000 people nationwide and writes regional and national marine safety curriculum and other publications. We are also involved with research in fishing safety issues. We are aware of and understand the dissertation research entitled **Learning Preferences of Commercial Fishermen** being conducted by Robert W. Miller, a doctoral candidate in the College of Education at the University of South Florida, Tampa/IRB board Florida.

AMSEA is aware of his intention to utilize members of the national network of AMSEA marine safety instructor's to collect data through a voluntary and anonymous survey of commercial fishermen, who have chosen to participate in marine safety education classes across the eight identified regions of his research study.

I, Jerry Dzugan, Executive Director of AMSEA confirm that our organization will support the research being conducted by Mr. Miller and that AMSEA will provide any available support for this research that we can within the limits of our budget and our policies. AMSEA supports any research, which may provide critical knowledge to assist in saving the lives of mariners.

Printed name Jerry Dzugan

Signature _____

Date 2/6/2014

Support Organizations Alaska Dept. of Health & Social Services, Section of Epidemiology, Division of Public Health – National Institute for Occupational Safety & Health – Southeast Alaska Regional Health Consortium – University of Alaska Sea Grant, Marine Advisory Program – U.S. Coast Guard 17th District – State of Alaska Department of Public Safety

Appendix I

University of South Florida Institutional Review Board Research Approval



RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
(813) 974-5638 • FAX(813)974-7091

April 1, 2014

Robert Miller
Adult, Career and Higher Education
Tampa, FL 33612

RE: **Exempt Certification**
IRB#: Pro00015234
Title: Learning preferences of commercial fishermen

Study Approval Period: 4/1/2014 to 4/1/2019

Dear Mr. Miller:

On 4/1/2014, the Institutional Review Board (IRB) determined that your research meets USF requirements and Federal Exemption criteria as outlined in the federal regulations at 45CFR46.101(b):

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:
(i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

Approved Documents:

[Robert Miller Proposal](#)

[Informed Consent](#)

As the principal investigator for this study, it is your responsibility to ensure that this research is conducted as outlined in your application and consistent with the ethical principles outlined in the Belmont Report and with USF IRB policies and procedures. Please note that changes to this protocol may disqualify it from exempt status. Please note that you are responsible for notifying the IRB prior to implementing any changes to the currently approved protocol.

Appendix I (continued)

The Institutional Review Board will maintain your exemption application for a period of five years from the date of this letter or for three years after a Final Progress Report is received, whichever is longer. If you wish to continue this protocol beyond five years, you will need to submit a new application at least 60 days prior to the end of your exemption approval period. Should you complete this study prior to the end of the five-year period, you must submit a request to close the study.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

A handwritten signature in black ink, appearing to read "Kristen Salomon", followed by a horizontal line.

Kristen Salomon, Ph.D., Vice Chairperson
USF Institutional Review Board