

AN ABSTRACT OF THE THESIS OF

Kimberley M. Preston for the degree of Master of Science in Environmental Sciences presented on March 21, 2019.

Title: Exploring How Institutionalized Scuba Diving Training and the Diver Experience Influences the Diver's Conceptualization of the Marine Environment

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The purpose of this grounded theory mixed methods study is to understand how new scuba dive students are creating meaning of their relationship to the marine environment and how that might be shaped by dive training and dive experiences. Eighty-one scuba dive students enrolled in a standardized entry-level dive course conducted in two locations, participated in this study. Participating dive students completed a questionnaire, composed of closed- and open-ended questions, before, immediately after, and three months after completing the open water dive portion of the dive training process. The quantitative portion of the questionnaires assesses participant's Nature Relatedness, place attachment to the marine environment, motivations for diving and perceptions of the dive community in relation to self. The qualitative portion allows individuals to reflect upon their own experiences and relationships with the marine environment in their own words. The results of this study indicate that this community of emerging divers possess: (a) positive Nature Relatedness and marine place-attachment that did not significantly change through the dive training process, (b) sightseeing, exploratory, and adventure-related

motivations for diving, (c) perceptions of the dive community that matched their own interests, and (d) differences in how they conceptualized the marine environment throughout the dive training and dive experience. As revealed through their responses, new dive students drew upon social constructs to embed their understanding of the marine environment, transforming it from a physical space to an *oceanscape* imbued with meaning. I use schema theory to help understand both the shifts and continuities seen in how these dive students constructed the *oceanscape* over time. The findings of this study can inform the Professional Association of Diving Instructors and other dive certification organizations about how to further develop their learn-to-dive curriculum based on the understanding that the cognitive impact of learning to dive goes beyond attaining a certification card.

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Exploring How Institutionalized Scuba Diving Training and the Diver Experience Influences the
Diver's Conceptualization of the Marine Environment

by
Kimberley M. Preston

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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Kimberley M. Preston, Author

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CHAPTER 1 INTRODUCTION

Self-Contained Underwater Breathing Apparatus (Scuba) diving is one of the fastest growing recreational activities in the world (Thapa, Graefe, & Meyer, 2005) and, at the turn of the twenty-first century, there were about 5 to 7 million active divers worldwide (Jennings, 2007). There have been concerted efforts in the last twenty years to understand diver impact on the marine environment and incorporate environmentally friendly practices into the dive tourism industry and training programs. Numerous impact studies have been conducted to understand diver underwater behavior based on factors such as diver values, perceptions, experience-level. However, these studies treat divers as a normalized group, rather than a complex community of learners. Following the dive students through the certification process was in answer to the call for a better understanding of the diver community (Thapa, Graefe, & Meyer, 2005).

The Professional Association of Diving Instructors (PADI) is the largest diver certifying organization in the world and certifies approximately 1,000,000 divers every year (Professional Association of Diving Instructors [PADI], 2019). Considering this influx of new divers every year and widespread and growing concern about the health of the marine environment, it is important for dive certification organizations to encourage marine environmental awareness. PADI is one such diver certification organization that has shifted focus towards ocean health-related goals in the last twenty years. In November 2016, PADI launched a social responsibility program comprised of four-pillars of change: Ocean Health, Marine Animal Health, People and Community, and Healing and Wellness. The first two of these pillars directly address marine-related themes. In conjunction with these pillars, PADI's most basic level of certification (Open Water Diver) includes lessons on safe and appropriate encounters with marine life and addresses ocean conservation issues.

Understanding how new divers are creating meaning of their relationship to the marine environment and how that might be shaped by dive training and dive experiences can help inform PADI and other dive certification organizations, about how to further develop their learn-to-dive curriculum and further incorporate environmental responsibility goals of promoting ocean-conservation aware divers.

Problem Statement

Lack of understanding how (if at all) the experience of diving/dive training influences people's relationship with or connection to the marine environment potentially constrains dive training programs' ability to develop participant-based dive training curriculum or make claims about the role of scuba diving in generating marine stewards.

Purpose

The purpose of this mixed methods study was to explore how institutionalized scuba dive training/certification and the diver experience influences the diver's nature and marine relatedness through the lens of divers-in-training in Oregon. This research included new dive students enrolled in the entry-level PADI Open Water Diver courses in Oregon to investigate the ways in which these dive students' connection to the marine environment evolved considering their training and first dive experiences. This study was conducted using a grounded theory approach in three phases (before, immediately after and three months after dive students completed their first open water dive), each phase comprised one questionnaire containing closed-and-open-end questions.

Guiding Questions

Considering the grounded theory approach to this research, the guiding questions were designed to illuminate the dive experience through participant-generated data. The following three questions guided this research:

- (Q1):** How do scuba dive students describe the marine environment before and after the diver training?
- (Q2):** How do scuba dive students describe the experience of diving and their relationship with the marine environment?
- (Q3):** What are scuba dive students' nature relatedness, values of the marine environment, perceptions of the dive community and motivations for diving before, after and three months after the open water dive experience?

CHAPTER 2 RELEVANT LITERATURE AND THEORETICAL FRAMEWORK

This chapter begins with an overview of outdoor recreation then water-based recreation to situate scuba diving in the broader context and to establish the significance of scuba diving within these broader fields. Then a condensed review of the origin of scuba diving certification will be provided and early scuba diving research and dive tourism with a transition into a discussion of contemporary scuba research in the context of this study. Finally, the chapter will be concluded with a discussion of the theoretical frameworks that offered the most explanatory power for the data.

Relevant Literature

Outdoor recreation is defined as leisure activities that occur outside and can take a variety of forms (e.g. skiing, fishing, snorkeling, camping, horseback riding, etc.), from more physically demanding to sedentary (Cordell, 2012).

Outdoor recreation. In the post-World War II era, outdoor recreation participation increased, because of increased income, improved transportation, and a shift from an agrarian to a manufacturing-based economy (Cordell, 2012). Outdoor recreation in North America has seen great diversification in activities in the last 70 years, stemming from both the public and private sector, and an increase in recreation sites (at the federal, state and local levels) (Gartner & Lime, 2000). The “number of outdoor recreation participants increased about 7 percent between 2000 and 2009 for 50 nature-based outdoor recreation activities, and the number of activity days increased 30 percent” (Cordell, 2012, p. 17).

Well-being implications of outdoor recreation. Outdoor recreation is touted as enhancing personal physical, mental, social and cultural/spiritual well-being. Engaging in some outdoor recreational activities can also engage participants intellectually, through informal

education such as interpretive signs on trails or interpretive talks (Ham, 1992) and foster academic success (Hattie, Marsh, Neill, & Richards, 1997). Spending time outdoors has also been associated with perceived emotional well-being (Korpela, Borodulin, Neuvonen, Paronen, & Tyrväinen, 2014), have restorative effects (Hartig, Mang, & Evans, 1991) and can support cognitive function (Berman, Jonides, & Kaplan, 2008).

Ecological implications of outdoor recreation. Outdoor recreation also has great ecological implications—from impacting the environment through outdoor activities to preservation of natural spaces for posterity. Human connection to nature—specifically facets such as personality, attitudes, prior knowledge or values—predict positive environmental behavior (Hines, Hungerford, & Tomera, 1986-1987). Whereas lack of connection to nature or natural spaces could lead to environmentally degrading behavior (Schultz, Shriver, Tabanico, & Khazian, 2004). Outdoor recreation research is an “interdisciplinary applied field of study” that is often associated with research-based management implications (Manning, 2011). Early outdoor recreation research was rooted in ecology, though as outdoor recreation areas and activities saw an increase in participation, social issues such as crowding, preferences, attitudes, visitor satisfaction and other norms became more prevalent foci of the field (Manning, 2011).

Economic implications of outdoor recreation. Outdoor recreation accounted for an estimated \$412 billion of gross domestic product in the United States 2016 fiscal year and showed faster growth from 2015 to 2016 than the U.S. economy overall (United States Bureau of Economic Analysis, 2018). In Oregon, where this study is centered, outdoor recreation activities, including water-related activities, generated \$16.4 billion in annual consumer spending in the 2016 fiscal year (Outdoor Industry Association [OIA], 2017). A reported 69% of Oregon residents take part in outdoor recreation every year and outdoor recreation provides 172,000

direct jobs in Oregon (OIA, 2017). In 2017, Oregon legislature passed House Bill 3350, which the governor signed into law creating the office of Outdoor Recreation (under the Department of Parks and Recreation) to provide focused attention to managing the outdoor recreation market and the natural resources involved in nature-based activities (Oregon Parks and Recreation Department, n.d.).

Water-based recreation. This statewide outdoor recreation movement includes water-based recreation--broadly encompassing leisure activities in and around fresh or saltwater in various forms (Jennings, 2007). Scuba diving is one such water-based recreation activity. Oregon offers access to over 260 documented dive sites throughout the state, both inland and on the coast (Oregon Dive Sites, 2018) with a recorded 1 million user occasions (number of times Oregon residents engaged in scuba diving) in 2011 (Rosenberger & Lindberg, 2012).

Why talk about scuba? Since its inception as a scientific and military tool in 1943, scuba has become re-popularized as a recreational activity for the public (Jennings, 2007). Scuba diving has professional applications (deep-sea welding, scientific data collection), however this study focused on recreational application in which scuba is “undertaken by choice and for pleasure” (Phelps, 1988, p. 34). Today, scuba diving is one of the fastest growing recreational activities in the world (Thapa, Graefe, & Meyer, 2005). At the turn of the twenty-first century, there was an estimated 5 to 7 million active divers worldwide (Jennings, 2007). Global coral reef tourism generates \$36 billion per year, of which, nearly \$20 billion is generated by on-reef activities such as scuba diving and snorkeling (Spalding et al., 2017). In the United States, 3.6 million people age 16 and older took part in scuba diving between 2005 and 2009 (Cordell, 2012). In the United States, on-reef activities alone generate approximately \$860 million per year (Spalding et al., 2017). However, diving is not limited to the tropics or to the ocean.

Recreationalists also dive in temperate and arctic waters; they also dive in lakes, rivers, oceans, seas, and quarries; for reasons ranging from food harvest, exploration, sightseeing, videography/photography, data collection, and even professional deep-sea welding.

Scuba certification. Participating in modern scuba diving requires a certain degree of physical health, swimming capabilities, formal training and specialized equipment. In 1952, the death of two scientific divers associated with the Scripps Institution of Oceanography sparked the formation of a statewide committee (including health professionals, biologists, fellow divers, and engineers) to develop more stringent requirements for diving—including equipment safety regulations, medical history checks, instructor training, and more rigorous dive certification standards (Scripps, 2012). Following the committee meeting in 1953, the first dive instructor training program was established in the U.S. (the Los Angeles Underwater Instructors Program) followed by the formation of the first scuba dive education organization, PADI in the early 1960s (Jennings, 2007; Scripps, 2012). Today, PADI hosts 6,600 dive centers and resorts across 186 countries and territories (PADI, 2019).

Scuba history and early research. Early scuba research stemmed from fields such as health science and physical education. The physiological impacts of scuba diving (inner-ear trauma (Boni, 1979); oxygen-consumption (McNeil, 1979); pneumonia in divers (Jarczyk & Rose, 1978); physiological problems diving at 70 meters (Haimson, 1972); decompression sickness (Furry, Reeves, & Beckman, 1966)) were heavily researched. Scuba was discussed as a physical education activity, predominantly in college programs and centered on demands for safer, more standardized scuba curriculum (Busch, 1965; Hartmann, 1971; Cramer, Egstrom & Sommers, 1974).

While conversations about the health and physiology of scuba diving and scuba divers continue, discussion of nature and nature-relatedness did not become prevalent in recreational diving until the 1970s, when the state of natural resources was a part of the global conversation. In the mid-1970's several major agreements were ratified, such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora and the Marine Mammal Protection Act. Concurrently, some practitioners saw modern recreational scuba diving instruction as prime avenue for marine science education (Somers, 1979).

In 1989, PADI took a major step towards marine stewardship by launching Project AWARE—an initiative to engage divers in marine conservation activities such as underwater debris collection. Today, Project AWARE is an independent non-profit organization and is joined on the global stage by numerous ocean conservation organizations, such as the International Coral Reef Initiative, and the United Nations Environmental Programme's Green Fins and Global Partnership for Marine Litter, to name a few. The last 30 years of scuba-related research has shown considerable interest in the diver/marine environment relationship (as described below), from diverse perspectives—such as education, behavior, tourism management, marine habitat management—though most studies focus on tropical, high-tourist dive sites, such as coral reefs.

Dive tourism. The scuba dive industry is a complex tourism system in which many stakeholders are involved, including the marine environment, and the importance of considering the local community in management decisions (Dimmock & Musa, 2015). In recent years, there has been a shift towards the need for more environmentally sustainable practices within the scuba dive industry, by assessing perceived crowding and informing site visit distribution (Szuster, Needham, & McClure, 2011; Zhang, Qiu, & Chung, 2015) or establishing dive

management plans, such as the Green Fins Code of Conduct, with “assessment protocol to monitor adherence” (Hunt, Harvey, Miller, Johnson, & Phongsuwan, 2013, p. 36). While it is important to consider stakeholders when developing management strategies, these studies do not address what it means from the divers’ perspectives to be a part of the scuba community and how the experience of scuba diving might shape their subsequent perspectives, values, or even management preferences.

Nature relatedness. In attempts to address the disconnect between attitudes towards nature and environmentally responsible behavior (ERB), scholars have proposed alternative metrics that possess stronger predictive capacity for ERB. These include scales that purportedly assess emotional and cognitive ties to nature (Connection to Nature scale; Mayer & Frantz, 2004), value-orientations from protectionist to use (Needham, 2010), sociological perspective of environmental values (New Ecological Paradigm; Dunlap, Van Liere, Mertig, & Jones, 2000) and ecological self (Ecological Identity Scale; Walton & Jones, 2018)).

Nature Relatedness (NR) arose in response to a call for a more comprehensive view of connection to nature and this personal connection to nature may be a more effective means to motivate people to practice ERB (Nisbet et al., 2009). The Nature Relatedness incorporates aspects of perspective, self, and most importantly for this study, experience. As Mileham (2016) noted, the NR scale incorporates an individual’s experience in/with nature—an element that is lacking in many other scales. I use the NR scale in this study to measure new diver student’s connection to nature before, directly after and three months after completing the open water dive component of dive training.

Place attachment. Nature Relatedness broadly addresses nature connectedness, but to gain insight into new diver connection to the marine environment specifically, I drew from

concepts of place attachment, which explores the bond people have with places (Kyle, Bricker, Graef, & Wickham, 2004). Place attachment includes the cognitive, behavioral and affective aspects of the meaning one makes of the particular place (Brown, Altman, & Werner, 2012) This construct is often applied in recreational studies and is commonly measured using a combination of factors, including place centrality, place dependence and place identity (Eder & Arnberger, 2012; Kyle, Bricker, Graef, & Wickham, 2004) and was adapted for this marine-based study.

Expectations and motivations. According to Schreyer and Roggenbuck (1978), individuals pursue recreational activities expecting their needs will be met. Alignment of visitor expectations and experience outcomes are key facets of visitor satisfaction, which is often used in outdoor recreation management to maintain the quality of visitor experience (Manning, 2011). Manfredo, Driver, and Tarrant (1996) created a validated scale, the Recreation Experience scale, to measure visitor motivations and visit outcomes.

Lucrezi, Saayman, and van der Merwe (2013) provided a robust literature review of diver preferences and motivations within their work—concluding that the literature supports that diver motivations and satisfaction align with a preference for viewing marine life and exploring the marine environment. Todd (2002) reviewed diver motivations in the Great Lakes region, concluding with six primary motivations: personal challenge, stature, escape, learn, adventure, and social interaction.

Meisel-Lusby and Cottrell (2008) expanded on the work of Todd (2002) and examined diver motivations, expectations and satisfaction, finding that motivations differ depending on dive experience-level. For instance, beginner divers were more likely to want to dive for novel experience and were more willing to be “physically challenged and scared” (Meisel-Lusby & Cottrell, 2008, p. 9) whereas advanced divers were more motivated to dive to connect with

fellow divers, use their equipment and de-stress. This was pertinent for the following study as the population in question included beginner divers. However, Meisel-Lusby and Cottrell (2008) were concerned with comparing diver satisfaction across different diver groups that were already dive certified (international vs local; beginner vs advanced), rather than following divers during the certification process.

Diver behavior. Diver underwater behavior (particularly impact on reef substrate) has been a popular topic of study considering heightened efforts to promote sustainable coral reef tourism (Spalding et al., 2017).

Pre-dive briefings. Numerous studies have found that more environmentally focused pre-dive briefings significantly reduce the frequency of diver impact on substrate (Barker & Roberts, 2004; Camp & Fraser, 2012; Hammerton & Bucher, 2015; Krieger & Chadwick, 2013; Medio, Ormond, & Pearson, 1997; Toyoshima & Nadaoka, 2015) which can cause breakages, or (in a reef setting) an increase in coral disease (Lamb, True, Piyomvaragorn, & Willis, 2014) or suppress coral reproduction (Zakai, Levy, & Chadwick-Furman, 2000).

Experience level. Studies that examined diver experience, focus on *level* of dive experience, rather than the act/experience of diving. These studies have examined how the diver's level of skill influences diver behaviors. Thapa, Graefe, and Meyer (2005) showed the level of dive experience (or specialization) can serve a mediator for predicting environmentally responsible behavior. Chung, Au, & Qiu (2013) also examined diver experience and found low experience level and handling photography equipment during the dive appear to be related to increased diver impact on coral reefs. To the contrary, Roche et al. (2016) asserted that the "dive operator's behaviours and attitudes towards conservation" (p. 115) (rather than the divers

themselves), had a greater influence on diver impact of substrate than diver experience level or use of accessories.

Perceptions. Studies of perception in the scuba dive field have ranged from diver perceptions of the dive site quality, crowding, impact to social perceptions of scuba as a high-risk sport. Uyarra, Watkinson, and Côté (2009) examined diver perception of reef dive sites and found that divers that perceived a higher quality dive site (healthy coral and abundance of fish) reported a higher sense of enjoyment gained from the dive.

In recent years, studies have been conducted to assess dimensions (such as quantity and proximity of divers in one space) that may influence perceived crowding of underwater dive sites (Szuster, Needham, & McClure, 2011) and suggest using perceived crowding to determine site carrying capacity and visitation limits (Zhang, Qiu, & Chung, 2015).

Dearden, Bennett and Rollins (2007) examined scuba diver perceptions of the sport's impact (positive or negative) before and after diving and found that divers perceived scuba diving more positively after diving. The positive perception was largely associated with scuba diving as an educational experience.

Other scuba studies have examined the social perceptions of diving, such as a high-risk sport, comparing perceptions of scuba diving between divers and non-divers (Vanreusel & Renson, 1982) or the progression of perception of risk as divers advance in skill (Hunt, 1995).

Values and value-orientations. Outdoor recreation research encompasses social issues, including user-studies (Manning, 2011). Needham (2010) measured protection-use value-orientations in recreationalists visiting a coral reef and found that scuba divers were more likely to possess mixed-use values in relation to other recreationalists (beach walkers, snorkelers). Ong and Musa (2012) empirically examined relationships between environmental concern and diver's

self-reported underwater responsible behavior using linear regression and claimed that “most divers have a positive general attitude towards [the] environment” (p. 344). While providing valuable insight into categorical, quantitative attitudes and behaviors, this work does not invite the diver’s own voices into the conversation. The questionnaires were designed to elucidate ecocentric and technocentric attitudes, rather than allow the divers to express their values or illuminate the meaning the participants are creating of the marine environment in light of their dive experience in their own words, qualitatively.

The authors of these prior diver studies have focused on factors such as on the quality of marine-based knowledge or the quantity of dives logged in relation to the behavioral outputs, but do not discuss how divers reflect upon or internalize their experience of diving or learning to dive. The impact studies quantify diver impact on the environment through observation or self-reported behavior but do not provide a holistic context of how the diver mentally situates himself or herself within the environment.

Thapa, Graefe, & Meyer (2005) call for a better understanding of the diver community, a call which has yet to be fulfilled and was a key theme of my study. Previous studies have focused on the behavior, perceptions, values of divers with existing dive experience. This study was unique in that it followed individuals through the training process—before they start the dive training process through their first open water dive to months after their certification—to better understand the how, if at all, the experience of diving/dive training influences participant’s relationship with the marine environment.

Theoretical Framework

To help me understand how divers might situate themselves in relation to the marine environment, I drew from theory about the social construction of landscapes, schema theory and nature relatedness theory.

Social construction and landscapes. A social constructivism perspective informs the approach to data interpretation. The social construction theory, introduced by Berger and Luckmann (1966) and rooted in both sociology and philosophy, argues that reality is created by humans and social interactions. Berger and Luckmann (1966) posited:

I live in the common-sense world of everyday life equipped with specific bodies of knowledge. What is more, I know that others share at least part of this knowledge, and they know that I know this. My interaction with others in everyday life is, therefore, constantly affected by our common participation in the available social stock of knowledge. (p. 56).

From this perspective, human's understanding of reality is based on sets of social processes and patterns that may be shared within social or cultural groups. While individuals draw upon these shared social banks of knowledge, they also interpret knowledge through their own unique lived experiences. In this study, the baseline assumption was that scuba diving and dive training is composed of these elements (experiences, social interactions, culture, and symbols) and will contribute in some way to dive students' construction of their own reality.

Social construction of landscapes. The social construction perspective can also be applied to human constructs of nature or 'landscapes,' which was pertinent to the goals associated with this study of understanding how dive students view/come to view the marine

environment. Greider and Garkovich (1994) introduced the theoretical framework of socially constructed landscapes:

‘Landscapes’ are the symbolic environments created by human acts of conferring meaning to nature and the environment of giving the environment definition and form from a particular angle of vision and through a special filter of values and beliefs. . . These landscapes reflect our self-definitions that are grounded in culture (p. 1).

In essence, humans imbue the natural environment with cultural and personal meaning thus transforming the physical environment into landscapes. The social construction of landscapes framework helped orient this study in understanding that when divers described the marine environment, they were really discussing the *oceanscape* embedded with meaning.

Schema. Scuba diving is both a recreational pursuit, and a structured free-choice learning activity; that is, dive students are learning to dive for recreation, of their own fruition, outside of work obligations or academic requirements. However, the dive training process follows a prescribed, standardized structure. Within this structure, students are learning and processing information presented in the form of curriculum and practicum. To help make sense of how dive students incorporate their dive training and dive experience into their view of the world, I drew from Piaget’s Theory of Cognitive Development, specifically, from the concept of schema.

Schema theory has appeared in formal education and learning comprehension studies and has been used as means to understand how learners organize and process knowledge (Nassaji, 2007). According to Piaget (1952), an individual’s cognitive development is a continual process of sifting, sorting, organizing information gained through interactions with the social or physical

world, and the hypothetical manifestations of the resulting (though likely, impermanent) cognitive structures are called ‘schemata’ (or schema as the singular).

Schemata are mental structures that help organize and situate new information or experiences and, when considered together, form one’s view of the world. Schemata are formed and reformed continually throughout a lifetime and help to both generalize based on consistencies and themes among schema or to differentiate based on localized information.

Frederic Bartlett, an experimental psychologist, described, however, that schemata are also social in nature and that schemata “operate at the developing transaction between organism and environment, rather than being purely cognitive phenomenon” (Wagoner, 2013, p. 559).

As an individual encounters new information or experiences, the new knowledge interacts with the existing schema (or mental model of the workings of the world) in one of two cognitive processes: “intellectual adaptation, like every other kind, comprises putting an assimilatory mechanism and complementary accommodation into progressive equilibrium” (Piaget, 1952, p. 7). As Wadsworth (1996) explained, if the new information aligns with an existing schema, the knowledge/experience will be added to and incorporated within the schema, thus, ‘assimilating’ the knowledge/experience. If the new information does not align or conflicts with an existing schema, the knowledge/experience will either cause an existing schema to adapt or create a new schema—both considered ‘accommodation’ (Wadsworth, 1996). The interchange between assimilation and accommodation propels an individual towards equilibrium, a balanced state, though new knowledge/experience perpetuates disequilibrium and a continued need for assimilation or accommodation (Wadsworth, 1996).

In this study, schema theory aided the understanding of the ways in which, if at all, acquisition of scuba dive knowledge and experience prompted an evolution in the ways dive students connect to, relate to or conceive of the marine environment by seeking indication that aspects of scuba dive knowledge, experience, and social interactions were assimilated or accommodated within existing schemata or in creating a new schema.

The elements of the cognitive development process (including schema), as discussed by Piaget, does not consider affect. Affect and emotion are pervasive in the lived experience and cannot be discounted. In the scope of this study affective and cognitive schema were treated similarly, though in future studies the role of affect in cognitive development or the qualities of the affective development should be explored to provide a more holistic picture and deepen our understanding of the emotional aspects of the dive experience.

CHAPTER 3 DESIGN, METHODS OF DATA COLLECTION AND ANALYSIS

This chapter describes the study design, method, and analysis process used to gain an understanding of new entrants to the Oregon dive community and explore how scuba dive students related to the marine environment throughout the dive training process. First, the study design and procedural aspects of the study (setting, sampling, and recruitment of participants) is described, then the data collection methods and sources of data, and concluded by data analysis strategies, data management and easement of validity concerns.

Design

A grounded theory approach was employed to analyze the qualitative data. The essence of this approach is to start a detailed analysis of the nuanced ideas, gradually and iteratively working up bigger ideas to help to better “understand human processes and to construct theory” (Saldaña, Leavy, & Beretvas, 2011) or reveal theory. An important element of grounded theory is to be cognizant of my role as the researcher.

To address the guiding questions in this study, I used a longitudinal, concurrent mixed methods research design to collect both quantitative (fixed-choice questions) and qualitative (open-end questions) information. Collecting quantitative and qualitative data concurrently, I brought two datasets together to gain “a more holistic view of the research problem” (Leavy, 2017, p. 175) over the course of the dive training process. Using both quantitative and qualitative data collection methods and analysis can “uncover general trends while gaining insight into individual differences” (Diamond, Luke, & Uttal, 2009, p. 86).

Researcher stance. As described in the review of relevant literature, many scuba dive-related studies are quantitative, focusing on quantifying aspects of the diving and the dive industry. These studies are important contributions to the body of scuba dive knowledge.

However, as a researcher, I hold a constructivist paradigm and I appreciate that subjectivity and nuance inherent within one's experiences, values, perceptions and beliefs. I concertedly approached this research pragmatically, using mixed methods to bridge quantitative and qualitative realms.

Furthermore, I am a certified diver and thus have personal experience within the scuba diver community. While my voice and lens cannot be eliminated, the focus of this work was to understand how new divers orient themselves in the experience of scuba diving through participant insight. Furthermore, my own identity is strongly tied to the natural world, but this work is not intended to be an environmental vendetta: this work is intended to capture insight into how divers are making meaning of the marine environment, so that the institutions and programs that surround and support this community can better fulfill their needs.

Context. To scuba dive, prospective divers must participate in scuba dive training classes through a dive training operator that hosts training through a particular dive certification organization. Basic dive training classes are led by an instructor who teaches prospective divers through in-class and practical lessons. The classroom component involves a review of a dive training manual, discussion of topics, including proper use of equipment, descent and ascent protocol, and safety (above and below surface), and assessment (quizzes). The classroom component can also be taken online or on a smartphone or tablet.

The practical component involves 'confined diving', which is defined as a "swimming pool with a depth appropriate to the activity or body of water that offer similar conditions regarding visibility, depth, water movement and access" (International Organization for Standardization [ISO], 2017), through which trainees can practice safe use of equipment and below-surface skills, under close supervision of the training staff.

The final assessment occurs in the ‘open water’, which is defined as a “body of water significantly larger than a swimming pool offering conditions typical of a natural body of water” (ISO, 2017) and involves a series of dives during which trainees must successfully execute certain skills (e.g. pre-dive safety checks, flood/clear mask, recover/exchange regulator, etc.). Once the trainee successfully executes the required skills, he or she is certified for life. Certification gives divers access to dive equipment (such as air) or dive trips (as in, one must show proof of certification, in most cases, to dive with an outfitter).

Setting and sampling. The setting of this study was the Pacific Northwest of the United States, specifically, the state of Oregon. The dive training in the Pacific Northwest is quite different than dive training in the tropics. Diving conditions in the Pacific Northwest are challenging (harsh conditions, low visibility, cold water, strong currents) and offer inconsistent rewards (marine life many not be as alluring as tropical marine life, if visibility permits a view of life at all). While safety is the top priority in dive training, instructors in the Pacific Northwest are challenged with training new divers who may be faced with three feet of visibility in the open water. In this case, dive technique takes precedence over sightseeing.

The population for this study was beginner dive students enrolled in PADI’s introductory-level dive training class called Open Water Diver, which is the gateway to advanced training courses. PADI is the largest scuba dive training organization in the world, and their curriculum and instructor training programs are standard worldwide. I used purposeful sampling to select 1) dive training programs that offered PADI dive training courses (as opposed to a different dive certification organization training program) and 2) prospective participants enrolled in the introductory PADI dive training course that were aged 18 or above.

Participants and recruitment. Based on prior relationships, I approached two dive program leaders who agreed to allow me to recruit participants at their establishments, which led to recruitment of two additional dive program leaders at two additional establishments, for two university-associated programs and two privately owned businesses (Appendix A). Participants were recruited from PADI Open Water Dive courses voluntarily during the summer and fall seasons of 2018 to represent both the ‘on-and off-seasons’ for dive training. Recruitment ceased at the end of the fall season 2018.

Once permission to recruit participants at each establishment was obtained, I worked closely with dive training staff to develop a recruitment plan that both aligned with their needs as instructors and the parameters of the IRB requirements. During the second session of the course, I introduced myself to the dive students, described the research project, outlined participant expectations, passed out consent forms (Appendix B, answered questions and asked for volunteers (aged 18 years or above) to take part. Once volunteers read, signed and returned consent forms, the first questionnaire (Pre-Dive) was handed out.

After initial contact, I visited each class during the subsequent pool training session, to reintroduce myself and continue to develop relationships and collect any completed questionnaires. Questionnaires were administered at three specific points in time in the dive training process: Phase 1) before participants dived in the open-water (Pre-Dive); Phase 2) after they dived in the open water (Post 1-Dive); Phase 3) three months after they dived in the open water (Post 2-Dive). The Pre and Post 1-Dive questionnaires were administered on-site, via a paper form, during the academic portion of the scuba class time, whereas the Post 2-Dive questionnaires were administered electronically via Qualtrics.

Questionnaires were collected and analyzed on a rolling basis (discussed in more detail below), so once the data reached saturation (no new concepts were emerging from the data) (Glaser & Strauss, 1967), recruitment ceased.

Data Collection Methods

All elements of the research design and implementation were reviewed and approved by the University's Institutional Review Board prior to starting the study (Appendix C). Participants provided pseudonyms that were used throughout the course of the study to maintain anonymity.

Instrument. A survey method in the form of a questionnaire was used to provide both quantitative and qualitative data. The questionnaires were composed of 19 fixed-ended questions and three open-ended questions derived from the literature and refined through pilot testing. The three questionnaires were composed of identical fixed-end questions but contained different open-end questions at each phase (see Appendix D).

As the researcher I am inherently the “primary *instrument* of the [research] endeavor” (Saldaña et al., 2011) and am inextricably linked to my social construction of the world. However, throughout the research process, I strived to stay true to the data and allow the narrative of the data to emerge without preconceived notions. For instance, I continually reflected on and worked to address validity concerns that arose, such as researcher bias and participant reactivity to the researcher (Maxwell, 2013) by writing reflective memos, working closely alongside seasoned advisors and collaborators, and retaining rather than discarding outliers.

Quantitative/fixed-ended questions. Through the questionnaires, participants were asked a series of ranked-scale questions, based on the previously published and validated Nature Relatedness (NR; Nisbet et al., 2010) scale and Marine Attachment (MA) (adapted from Kyle et

al., 2004) (see Figure 3.1). These structured questions allowed me to compare data “across individuals [and] time” (Maxwell, 2013, p. 88). The Nature Relatedness scale incorporates aspects of perspective, self, and (most importantly for this study), experience. As Mileham (2016) noted, the NR scale incorporates an individual’s experience in/with nature—an element that is lacking in many other scales. Seven of the original twenty-one NR prompts were eliminated from the questionnaire (based on pilot-study results) to minimize response fatigue and redundancy.

I adapted four ‘Marine Attachment’ prompts from Kyle et al. (2004), specifically addressing participant values of the marine environment, rather than nature in a general sense. These questions were ranked-scale, asking participants how much they agree or disagree with each statement using the following 5-point scale: Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4), or Strongly Agree (5).

To what extent do you disagree or agree with the following statements? (Circle one number for each statement that most closely matches your response).					
Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A lot of my life is centered around recreating in water (lakes, rivers, ocean...).	1	2	3	4	5
I get satisfaction from visiting water areas more than any other type of recreation area.	1	2	3	4	5
I don’t understand why others care about the marine environment.	1	2	3	4	5

Figure 3.1 This figure shows a sample ranked-scale question from the questionnaires. Additionally, participants were asked to rank a list of motivations, from most important (1) to least important (6), for learning to dive, both in relation to themselves and in relation to divers in general (Figure 3.2). The list of motivations was based on text in the Open Water Diver training manual (PADI, 2015) and included harvesting food, adventuring, becoming a marine

ambassador, sightseeing/exploring, collecting data as a citizen scientist/researcher, and photography/videography.

What are some reasons why you want to participate in recreational scuba diving? What are some reasons why you think other people want to participate in recreational scuba diving? (Rank the following items for both yourself and what may be the case for others. 1 = most important reason; 6 = least important reason).

Reasons for Diving	Yourself as a Scuba Diver	Scuba Divers in General
Harvesting Food	_____	_____
Adventuring	_____	_____
Becoming a Marine Ambassador	_____	_____
Sight-Seeing/Exploring	_____	_____
Collecting Data as a Citizen Scientist/Researcher	_____	_____
Photography/Videography	_____	_____

Figure 3.2 This figure shows the motivations question from the questionnaires.

Each participant created a pseudonym and had the option to provide the gender with which they most identify, their age, and whether they held prior dive experience. I also recorded the dive training site (city A or city B) and program type (public or private) upon collecting each questionnaire.

Qualitative/open-ended questions. Each questionnaire contained three open-ended questions (Table 3.1) and additional space was provided at the end of the questionnaire packet for additional commentary, if needed. Rather than explicitly ask participants about abstract concepts such as values or perceptions, I designed complementary sets of questions, both “generalized, present-tense and specific, past-tense questions” intended to add “a greater *depth* of understanding rather than simply greater breadth or confirmation of the results of a single method” (Maxwell, 2013, p. 104). The open-ended questions allowed individuals to reflect upon their own experiences and relationships with the marine environment, in their own words.

Table 3.1 Open-end questions in each phase of questionnaires.

Phase 1: Pre-Dive

- Why do you want to learn to dive?
 - Briefly share a memorable time you visited the ocean. For instance, what were you doing? Were you by yourself or with others? Were you on the beach or on a boat? What stood out to you? What were you feeling at the time?
 - What is your favorite part of being in the ocean and why?
-

Phase 2: Post 1-Dive

- What is your favorite part of being in the ocean and why?
 - What was most memorable about the open water dive? For instance, what were you doing? Were you by yourself or with others? Were you on the beach or on a boat? What stood out to you? What were you feeling at the time?
 - Imagine that you have a friend who is interested in learning to scuba dive. What would you share with them? Based on your experiences, what can they expect if they choose to learn to dive?
-

Phase 3: Post 2-Dive

- Briefly share a memorable time you visited the ocean. For instance, what were you doing? Were you by yourself or with others? Were you on the beach or on a boat? What happened? What stood out to you? What were you feeling at the time?
 - What was your favorite part of getting scuba certified and why?
 - How has your relationship with the ocean changed, if at all, since experiencing scuba diving?
-

Data Management

This section describes how the collected quantitative and qualitative data were organized and prepared for analysis.

Software. Nvivo Pro 12 was the most recent version of the software developed by QSR International and provided a digital platform to sort, organize the qualitative data and facilitate the subsequent analysis processes. IBM SPSS Statistic 25 was used to help organize and process the quantitative data. In each platform, data were organized by participant and phase, to enable later analysis of data across individuals and time.

Preparing and organizing quantitative data. All quantitative responses were entered directly into a spreadsheet in SPSS (Figure 3.3). To further prepare the qualitative data for analysis, all negatively worded Nature Relatedness prompts were re-coded to maintain a consistent, positive directionality across all prompts. For instance, for the negatively worded

prompt *I don't often go out in nature*, the ranked-scale (1 Strongly Disagree to 5 Strongly Agree) was reversed so as to reflect the opposite of the negatively worded prompt *I often go out in nature*. Also, age was re-coded as categorical, based on age ranges in the US Census Bureau (18-24, 25-44, 45-64). Dichotomous variables were coded as either 0 or 1 and categorical variables were coded as 0, 1, or 2. All missing data or data errors (e.g. a respondent circled two answer options when asked to circle one) were entered as 9.

	ID	Location	Institution	Pre_Ctrd	Pre_SatVstH2O	Pre_CareMarEn v Neg	Pre_ComtMar Neg
1	ABApril	0	0	9	9	9	9
2	ABAugust	1	1	2	2	1	1
3	AGFebruary	1	1	1	3	2	3
4	AHJuly	0	0	3	4	1	1
5	AHAugust	0	1	2	4	3	2
6	ARMay	1	1	3	4	1	1
7	ASApril	1	1	3	3	3	1
8	AVAugust	0	0	2	3	1	1
9	BBApril_1	1	1	5	4	4	1
10	BBApril_2	1	1	3	3	2	3

Figure 3.3 A sample view of the quantitative data sheet in SPSS.

Reliability. To run statistical comparisons of the respondents' environmental relations/values across different groups and across time, I combined multiple variable indicators (prompts) into a single, computed mean scale for both Nature Relatedness (NR) and Marine Attachment (MA) at each point in time. Before combining all MA indicators together and all NR indicators together, internal consistency among prompts was assessed by computing the inter-rater reliability (Cronbach's $\alpha > .60$). Prompts that were inconsistent with the other indicators were removed (see Appendix E). The MA scale for the Pre-Dive phase had a Cronbach's alpha of .63 and .65 for the Post 1 and 2-Dive phases, with only one prompt removed from two of the

scales. The computed Nature Relatedness scales had Cronbach's alpha of .78, .81, .82, for the Pre, Post 1 and Post 2-Dive phases (respectively) which was slightly lower than the original 21-item NR scale reliability ($\alpha = .87$) (Nisbet et al. 2009). One item was removed from the Pre and Post 1 scale to raise the reliability.

Composite indices were created based on the mean scale (Appendix E). As noted, a new scale was calculated for each questionnaire phase. Respondents that answered fewer than half of the prompts within a given scale were removed from the calculation and the denominator was automatically corrected.

Preparing and organizing qualitative data. The free-response portions of each questionnaire (either handwritten or typed), were typed into Microsoft Word documents and were saved individually by participant pseudonym and phase (e.g. DWApril_Post 1_free resp.doc). In NVivo, each participant was created as a 'case' which linked the participant's pseudonym with their demographic information. Figure 3.4 shows of how the files and cases were stored and organized in NVivo, once each file was uploaded into NVivo, linked to its respective case and filed into the folder of its respective phase (Pre, Post 1, or Post 2-Dive).

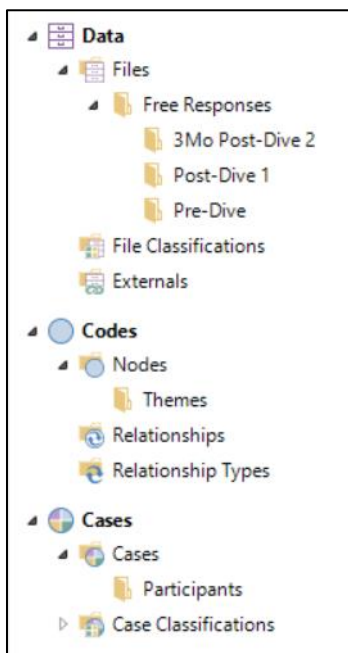


Figure 3.4 The data storage and organization in NVivo 12 Pro.

Data Analysis

In the following section, the process of analyzing the data is detailed. Consistent with concurrent mixed methods research design using a grounded theory approach, the quantitative and qualitative data were first reviewed holistically, analyzed separately then once again considered together in later discussion. As Figure 3.5 attempts to illustrate, the analysis process was composed of many inter-playing, overlapping stages, including grounded theory methods (memo writing, constant comparison, iterative coding), statistical tests and, ultimately, theory-illumination.

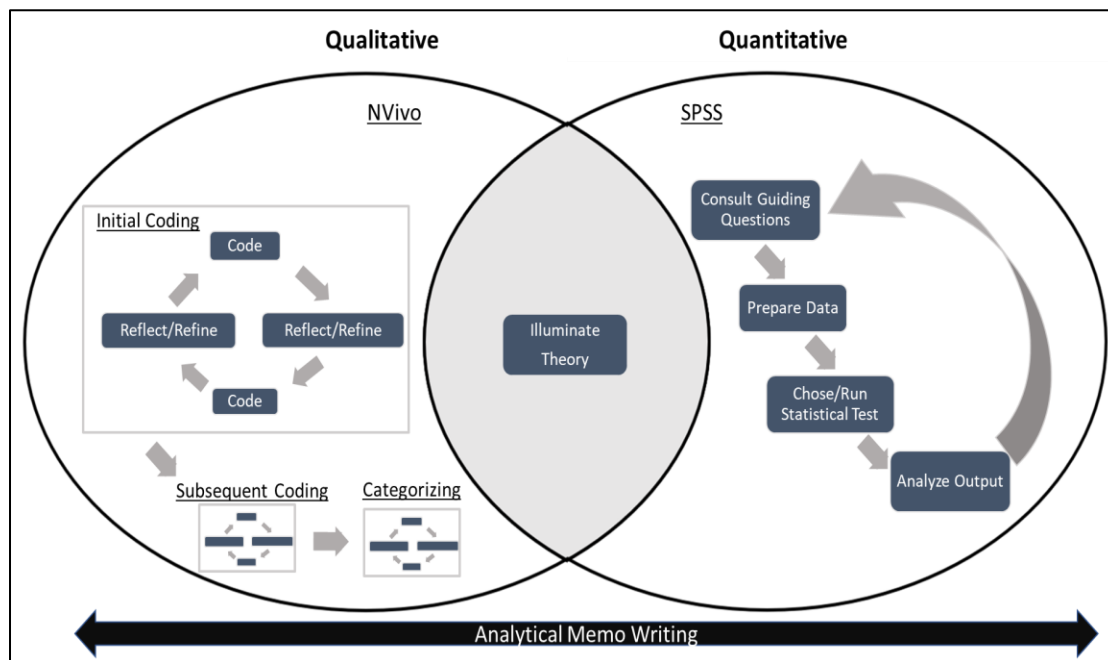


Figure 3.5 A diagram of the data organization and analysis.

First impressions and memo writing. The first step in the analysis process was reading each questionnaire as a whole and writing memos of my first impressions of the responses including both intra-questionnaire and inter-questionnaire reflections. Memo writing provided an informal opportunity to have a discussion with the data and myself (and occasionally the literature) to “facilitate reflection and analytical insight” (Maxwell, 2013, p. 20) and minimize bias as reflection promotes objectivity (Birks & Mills, 2011). These memos provided documentation of my initial thoughts and reactions to the data and were used to track the evolution of the analysis. Figure 3.6 is an example of the first-impression memos, showing how these memos were organized, including analysis at three scales (question-level, questionnaire-level and inter-questionnaire-level).

Analytical Memo: MJOctober, Pre-Dive

July 2019

Q2. Gets much satisfaction from visiting water area and cares for water areas, but does not have centric/exclusive focus on water areas. Has strong association with nature-self relatedness.

Q3. Place-based enrichment; Scuba could be another way to connect to a specific marine environment they will be living near/on (sailing). Diving as connection to place is part of future goals.

Q4. Did not respond for self as a diver. Divers in general fill the role of sight-seeing/explorer, harvesting food and adventure with ambassador and data collection at the bottom of the list.

Q5. Sees self as strongly part of nature, enjoys getting hands dirty and is comfortable in wilderness. Suggest not just a tourist or visitor but a part of nature and nature experience—nature experience is immersive.

Q6. High personal identity/spiritual connection to nature—actions impact nature and vice versa. High nature relatedness. Unequivocal.

Q7. Previous experience with water sport (snorkeling). Tropical experience with family member. Aesthetics and tranquility of being away from other people (escape). Lists specific ocean life.

Q8. Reiterates the peacefulness of being near the ocean, even in storm conditions. Sense of spiritual fulfillment.

Summary: Strong spiritual connection with nature and reciprocal relatedness between humans and nature. This respondent has 2 previous dive experiences, yet did not reference them in free response.

Connection: Echoes previous themes of tranquility and aesthetics but conveys sentiment through descriptive imagery rather than through explicit statements as encountered previously.

Figure 3.6 An analytical memo written after reading a Pre-Dive questionnaire.

Initial coding. I then began ‘coding’ the data—coding is a common method of categorizing qualitative data and is a means to help organize and analyze the data based on thematic groups (Maxwell, 2013). Coding is an interpretive process seeking to understand an aspect of the social world (Saldaña, 2009). As is consistent with the grounded theory approach, multiple iterations and rounds of analysis were conducted to allow patterns and theory to emerge. Exploring the data inductively, in the first round of coding, I split the data into fine-grain, nuanced categories (like-with-like) to identify the various concepts that were shared in the free responses. At this initial level of coding, *in vivo coding* was used “to keep the data rooted in the participant’s own language” (Saldaña, 2009) and stay true to the grounded theory approach.

Table 3.2 illustrates how responses of similar sentiment were coded after the initial *in vivo* code was established. Pre, Post 1 and Post 2-Dive questionnaire were collected on a rolling basis, so regardless of what phase of questionnaire responses were coded using existing codes or generated new codes.

Table 3.2 Examples of excerpts coded during the initial *in vivo* coding phase.

Participant and Phase	Data Coded as “Being on Another Planet”
DVMarch, Pre-Dive	<i>To be underwater. Its like being on another planet with other rules and animals different from other animals that I’m used to in this world we can’t breathe, but can fly.</i>
RRJanuary, Pre-Dive	<i>My favorite part of the ocean is the incredibly alien environment. Everything is so different than the world on land. Exploring in it is really an adventure.</i>
ZSMarch, Post 1-Dive	<i>All of the different, organisms, it’s like an alien planet! what happened - nothing big, we went to the bottom and then slowly came back to the shore. stood out - the vast space of water, the ability to move in this clear space, the perception of "other planet".</i>
DVMarch, Post 2-Dive	

Analytic memos. Throughout the initial coding process (and in subsequent rounds of coding), I wrote analytical memos to illuminate and address relationships within each code and among codes, as shown in Figure 3.7, including overlaps, co-occurrences, temporal context, and dissonant, resonant or repeating ideas or sentiment, multiple interpretations of the same text, etc. This exercise facilitated my critical thinking about the data and prompted analytic insights (Maxwell, 2013). Writing analytical memos involved comparing and contrasting, but also inspired reflecting on the analytical process and self-checking as the researcher.

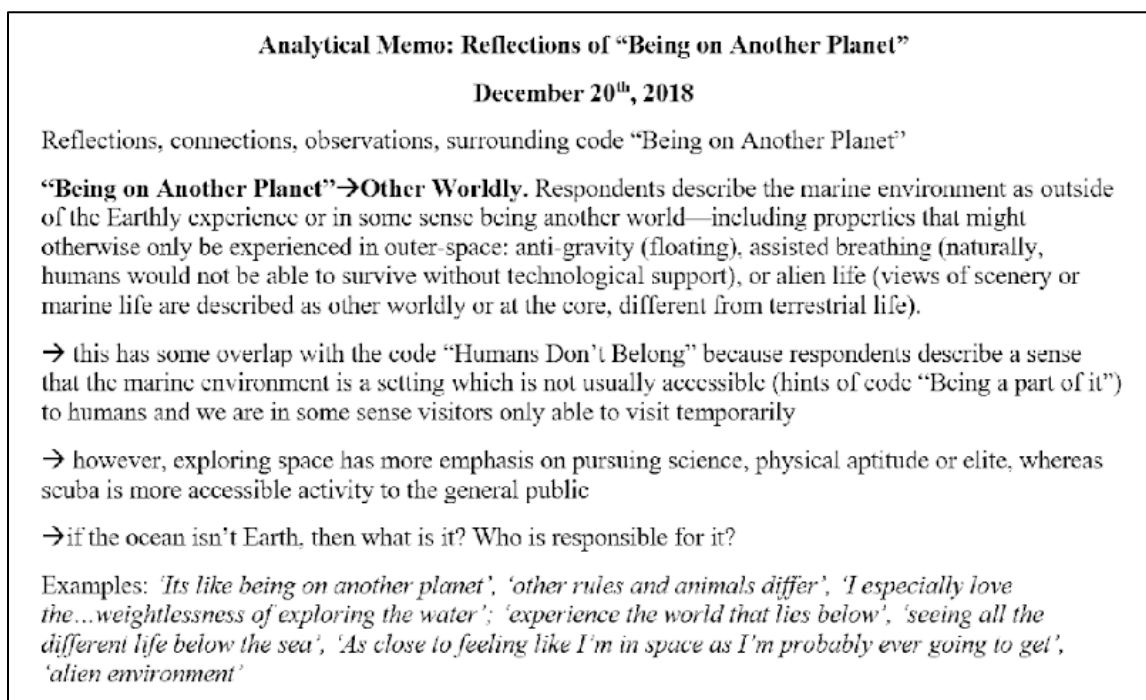


Figure 3.7 An analytical memo of initial impressions of code “Being on Another Planet”.

Concurrent coding. During the initial coding I analyzed nuanced categories within larger sections of data, in attempts to keep the responses rooted in the original context, thus numerous responses were coded concurrently, with two or more categories. For instance, as shown in Figure 3.8, a response given to an open-ended question in a Post 1-Dive questionnaire expressed five categories and was coded to reflect those ideas.

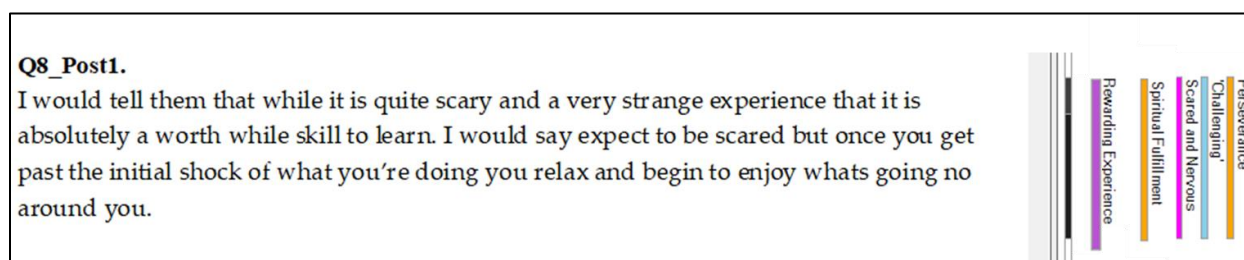


Figure 3.8 Visual tracking of code assignments and co-occurrences.

Subsequent coding. In the initial rounds of coding I ‘split’ the data to encourage a more nuanced analysis, while in the subsequent rounds of coding, I shifted towards a ‘lumping’

strategy, consolidating some codes to “get at the essence of categorizing a phenomenon” (Saldaña, 2009) but being cautious as not to create over-general ‘lumps’. Part of this process was transitioning the *in vivo* codes to descriptive codes (see Table 3.3) which principally uses nouns to encapsulate the text (Saldaña et al., 2011). The subsequent rounds of coding also involved revisiting of all the data and self-checking (as in, does this code stay true to the data?) to attempt to sincerely capture the content and meaning. I concluded the coding process knowing that there is no absolute conclusion to the process—I stopped the iterative coding process once satisfied that the codes attached to each datum were justifiably in alignment with the honestly interpreted intention of the response.

Table 3.3 Initial *in vivo* coding, transitioning to subsequent descriptive coding, capturing shift from ‘splitting’ to ‘lumping’ concepts.

Raw Excerpt	Coding	Concept Description
<p>“The ocean is vast, you are a tiny spec in a vast sea.” —JL November, Pre-Dive</p>	<p>Initial <i>in vivo</i>: “Tiny Spec, in a Vast Sea”</p>	<p>-Participant describes feeling small in perspective to expansive ocean.</p>
	<p>Subsequent descriptive: “Spiritual Perspective”</p>	<p>-Participant describes a sense of looking beyond the confines of the self.</p>

Categorizing. The final round of coding involved organizing codes into broader descriptive categories to help me understand the higher-level narratives at play. I used mapping (typing, printing, cutting out the codes and taping them onto a giant sheet of paper on which I could draw circles, arrows, and notes, and physically move the codes around, as displayed in Figure 3.9), drew from analytical memos to help make connections among codes and kept the guiding research questions in mind. Eventually, the existing descriptive codes became ‘child codes’ nestled under ‘parent categories,’ as seen in Figure 3.10, in which **Rewarding Aspects of Diving** became the parent code of five child codes (*Rewarding Experience, Perseverance, New*

World Opens Up, Camaraderie, Bragging Rights). A summarized codebook can be reviewed in Table 3.4 and the working codebook, including parent categories, child codes and descriptions, can be found in Appendix F.

Table 3.4 Categories of significant marine-related experiences; summarized codebook

Category Code: Dive students describe...

Child codes

Challenging Aspects of Diving: Difficulties or struggles in the dive experience

Challenges; PNW Conditions

Emotional Experience: Feelings for or emotional associations with the marine environment/marine life

Amazement and Awe Calm; Excitement and Exhilaration; Scared and Nervous; Wonder

Exposure to Ocean: Experiences they have had in/around marine environment/life

Harvest Activities; In the Tropics; Leisure Activities; Scuba; Solitary; Travel, Vacation, Visit; With Others

Motivations as Gain: Impetus for learning to scuba dive an opportunity for personal growth, improvement, pleasure or betterment

Leisure Pursuit; Personal Growth; Relationship with Ocean

Physical Experience: Bodily experience of being in/around marine environment/marine life

Connection to Breath and Body; Other Worldly; Sensory Input; Unpleasant

Relationship with Marine Life: Types of connections with marine life through experiences or interests

Love of Wildlife; Marine Life for Future Generations; Marine Life In Situ; Passive Viewing of ML; Personal Encounter with ML

Relationship I have with Marine Environment: Types of connections with the marine environment

Interest in Marine Ecosystem; Part of Identity; Protectionist; Underwater Frontier

Relationship with Marine Environment Since Diving: Connection to the marine environment that has developed since gaining diving.

Relationship Has Changed; Greater Appreciation; Increased Connection; More Responsibility; Relationship Has Not Changed

Rewarding Aspects of Diving: The various ways in which the experience of diving can be gratifying

Bragging Rights; Camaraderie; New World Opens Up; Perseverance; Rewarding Experience

Spiritual Experience: Spiritual experience of being in/around marine environment/marine life

Spiritual Fulfillment; Spiritual Perspective

Technical Aspects of Diving: The various ways in which the experience of diving is practical, procedural or methodical

Gear Costs; Safety First; Skill Demonstration

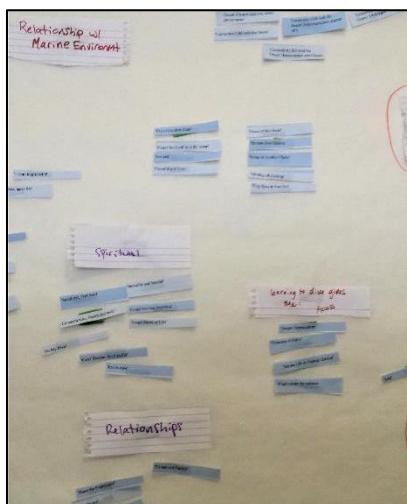


Figure 3.9 Photograph of mapping exercise used to generate categories.



Figure 3.10 The parent code Rewarding Aspects of Diving and child codes in NVivo

Co-occurrence. After the codebook was developed, Nvivo Pro 12 tools were used to understand relationships in the data in different ways. I used the Matrix Coding function to explore co-occurrences of codes, as in, which codes frequently appeared in conjunction (Figure 3.11). In this function, data files were specified, sets of codes were selected and compared against each other. If codes overlapped across the same piece of datum, the function generated a frequency output, consisting of the number of instances the two codes appeared together within the specified data set (e.g. Pre-Dive questionnaires only).

	A : Marine Life In Situ	B : Personal Encounter ...	C : Passive Viewing of ML
1 : Marine Life for Future...	0	0	0
2 : Scuba	1	3	3
3 : In the Tropics	1	3	4
4 : Travel, Vacation, Visit	1	2	3
5 : Leisure Activities	0	4	4
6 : With Others	1	2	7
7 : Part of Identity	0	0	0
8 : Protectionist	1	0	1

Figure 3.11 A coding matrix comparing occurrences of marine-related codes across categories. The color shading helps visualize the differences in frequencies (darker shading equates to a higher incidence of co-occurrence).

Summary

In summary, I recruited participants from PADI Open Water Diver training courses to complete three questionnaires composed of quantitative and qualitative at three points in time (before, directly after and three months after the open water dive). The quantitative responses of the questionnaire were intended to address guiding research question three, assessing Nature Relatedness, marine place attachment, motivations and perceptions. The resulting data were managed through IBM SPSS Statistic 25 and were prepared for analysis by recoding all negatively worded ranked scale prompts, addressing missing data and testing reliability of indices. The qualitative portions of the questionnaire were intended to address guiding research questions one and two, prompting dive students to describe the marine environment and relationship with the marine environment in light of their dive experience. The resulting data were managed and organized using Nvivo Pro 12 and were analyzed using iterative coding

(initial subsequent and categorizing) and writing of memos. The two sets of data were then considered together in the final assessment of the findings.

CHAPTER 4 FINDINGS

This chapter contains the findings from the mixed-methods study, both quantitative and qualitative findings gathered to address the guiding research questions:

- (Q1): How do scuba dive students describe the marine environment before and after the diver training?
- (Q2): How do scuba dive students describe the experience of diving and their relationship with the marine environment?
- (Q3): What are scuba dive student's nature relatedness, values of the marine environment, perceptions of the dive community and motivations for diving before, after and three months after the open water dive experience?

Descriptive and analytical statistics of the quantitative data are reported first (pertaining to guiding question three), followed by findings from the qualitative data (pertaining to guiding questions one and two).

Descriptive Statistics

In total, 81 participants were recruited from seven different Open Water Diver cohorts. There was a 65% response rate (81 students participated out of the 125 students approached). Overall, 157 questionnaires were collected, at varying levels of completeness. Participants were encouraged, but not required to complete all three questionnaires. About 64% of those who filled out the *Pre-Dive* questionnaire ($n_0 = 73$) completed the Post 1-Dive questionnaire ($n_1 = 47$). About 79% of those who filled out the Post 1-Dive questionnaire completed the Post 2-Dive questionnaire ($n_2 = 37$).

Demographics and descriptive information of participants is detailed in the following section (see Table 4.1). More dive students being trained in City B participated in the study than in City A and slightly more than half of respondents were enrolled through a public institution rather than a private. Nearly half of respondents identified as male, half as female and one

responded as other than male or female. Most respondents reported no prior dive experience. Those that reported previous dive experience reported one to two previous dives logged (with one outlier who reported previously logging 22 or more dives). The mean age of respondents was 28 years old, with the youngest being 18 and the oldest being 64 years of age.

Table 4.1 Participant demographics and descriptive information

<u>Descriptive Statistics</u>	<u>Sample size (n)</u>	<u>Valid Percentage (%)</u>
Location	81	100
City A	34	42
City B	47	58
Gender	77	100
Female	36	47
Male	40	52
Other	1	1
Previous Dives	78	100
Previous dives	12	15
No previous dives	66	85
Institution	81	100
Private	33	41
Public	48	59
Age	78	100
18-24	49	63
25-44	17	22
45-64	12	15

(Q3)

What are scuba dive student's nature relatedness, values of the marine environment, perceptions of the dive community and motivations for diving before, after and three months after the open water dive experience?

Means

Mean Marine Attachment scores. The mean MA scores across all participants at each period of time was positive (Table 4.2) (Pre-Dive M = 3.99, SD = 0.69; Post 1-Dive M = 4.12, SD = 0.63; Post 2-Dive M = 4.30, SD = 0.59) indicating an overall positive centrality of Marine Attachment. The lowest mean MA score was held by respondents during the Pre-Dive phase who had prior dive experience (M = 3.90; SD = 0.79) while the highest mean MA score was held by

the respondent during the Post 1-Dive who identified their gender as other than male or female

(M = 4.75, SD = N/A).

Table 4.2 Average scores for Marine Attachment1 based on questionnaire phase and descriptors

Variables	Pre			Post1			Post 2		
	mean	st dev	N	mean	st dev	N	mean	st dev	N
Institution									
Private	3.96	0.61	26	4.03	0.65	17	4.20	0.48	14
Public	4.01	0.73	47	4.18	0.62	30	4.37	0.65	23
Age									
18-24	3.97	0.76	48	4.18	0.65	29	4.31	0.65	22
25-44	4.02	0.30	15	4.00	0.60	13	4.14	0.59	9
45-64	4.03	0.81	10	4.10	0.63	5	4.67	0.14	3
Gender									
Male	3.93	0.70	39	3.91	0.62	22	4.05	0.60	14
Female	4.04	0.68	33	4.26	0.58	23	4.46	0.59	19
Other	4.67	-	1	4.75	-	1	4.50	-	1
Previous Dives									
Prior Dives	3.90	0.79	10	4.44	0.38	4	4.35	0.29	5
No Prior Dives	4.01	0.68	63	4.09	0.64	43	4.29	0.65	29

¹Means were based on a scale from 1 (strongly disagree, lower marine association) to 5 (strongly agree, higher marine association)

Mean Nature Relatedness scores. The composite mean Nature Relatedness scores across all participants at each period of time was positive (Table 4.3) (Pre-Dive M = 4.00, SD = 0.49; Post 1-Dive M = 4.04, SD = 0.52; Post 2-Dive M = 4.07, SD = 0.51) indicating an overall positive centrality of NR. The lowest mean NR score was held by one respondent during the Post 2-Dive phase who identified their gender as other than male or female (M = 3.14, SD = N/A) while the highest mean NR score was held by respondents during the Post 2-Dive phase (M = 4.32, SD = 0.43) who identified as female.

Table 4.3 Average scores for Nature Relatedness¹ based on questionnaire phase and descriptors

Variables	Pre			Post1			Post 2		
	mean	st dev	N	mean	st dev	N	mean	st dev	N
Institution									
Private	3.86	0.51	26	3.93	0.50	17	3.87	0.43	14
Public	4.09	0.47	47	4.10	0.52	30	4.20	0.53	21
Age									
18-24	4.05	0.45	48	4.07	0.51	29	4.16	0.51	21
25-44	3.91	0.62	15	4.01	0.53	13	3.95	0.53	8
45-64	3.94	0.53	10	3.91	0.63	5	4.24	0.58	3
Gender									
Male	3.95	0.40	39	3.99	0.46	22	3.86	0.46	12
Female	4.08	0.58	33	4.11	0.58	23	4.32	0.43	19
Other	3.54	-	1	3.62	-	1	3.14	-	1
Previous Dives									
Prior Dives	4.18	0.36	10	4.08	0.58	4	4.10	0.70	5
No Prior Dives	3.98	0.51	63	4.03	0.52	43	4.11	0.49	27

¹Means were based on a scale from 1 (strongly disagree, lower relatedness to nature) to 5 (strongly agree, higher relatedness to nature).

Effects of Demographics on Marine Attachment and Nature Relatedness

None of the data proved to be normally distributed, Kruskal-Wallis H tests (a nonparametric version of one-way analysis of variance, to compare continuous dependent variables with categorical or dichotomous independent variables) were conducted to see if there were significant differences in mean MA or NR (dependent variable) within groups (independent variables) during one particular phase of the study (Pre, Post 1 or Post 2-Dive). The mean MA and NR were compared for the following variables: private vs public institution, age categories (18-24 vs 25-44 vs 45-64), gender (Male vs Female vs Other), previous dive experience vs no previous dive experience, and effect size of eta (η) was calculated (see Table 4.4 for details).

Institution. The divers enrolled in their dive class through one of two institutions: either a private business or a public organization (such as a college). According to the Kruskal-Wallis H test, the type of institution in which dive students enrolled yielded significantly different ($p < .05$; $\eta = 0.326$) NR mean scores only in the Post 2-Dive phase, with a typical effect size. Respondents enrolled in a private institution ($M = 3.87$, $SD = 0.43$) yielded a significantly lower mean NR score versus at those enrolled in a public institution ($M = 4.02$, $SD = 0.53$). In all other cases, type of institution did not yield significant differences in mean MA or NR scores.

Gender. There was also a significant difference ($p < .05$; $\eta = 0.556$) in NR in the Post 2-Dive questionnaires among genders (Male, Female, and Other), with a substantial effect size. Bonferroni's correction for multiple tests revealed that the statistical difference ($p = .045$) occurred between males ($M = 3.86$, $SD = 0.46$) and females ($M = 4.32$, $SD = 0.43$) in the Post 2-Dive questionnaires. This indicated that female respondents had a significantly higher NR score three-months after their open water dive than that of the male respondents.

Prior dive experience. Respondents with previous dive experience ($M = 4.35$, $SD = 0.29$) had a mean MA score that was statistically different ($p < .05$; $\eta = 0.141$) from those without previous dive experience ($M = 4.29$, $SD = 0.65$), with a minimal effect size; those with previous dive experience showed a higher MA score in the Post 2-Dive questionnaires than those with no previous dive experience. Otherwise, the Kruskal-Wallis tests revealed no other significant differences among MA or NR across dive experience groups in each phase.

The results showed no significant difference among age groups in either NR or MA in any of the phases.

Table 4.4 Differences in mean¹ Marine Attachment and Nature Relatedness scores among different groups at each phase.

Variables	Pre			Post1			Post 2		
	H-value	p-value	Eta (η) Effect Size ²	H-value	p-value	Eta (η) Effect Size ²	H-value	p-value	Eta (η) Effect Size ²
Marine Attachment									
Institution	.295	.587	.032	.465	.495	.113	1.785	.182	0.144
Age	.043	.979	.038	.737	.692	.129	1.822	.402	.229
Gender	1.571	.456	.141	5.082	.079	.325	4.327	.115	.336
Previous dive experience	.101	.751	.053	1.161	.281	.155	.002	.039*	0.141
Nature Relatedness									
Institution	2.957	.085	0.224	1.305	.253	0.160	4.666	.031*	0.326
Age	1.254	.534	.123	.488	.783	.103	1.446	.485	.195
Gender	3.501	.174	.168	1.974	.373	.165	8.382	.015*	.556
Previous dive experience	1.532	.216	0.140	.001	.970	.024	.001	.979	.010

¹Means on scales of 1 “strongly disagree” (lower MA or NR) to 5 “strongly agree” (high MA or NR).

²Eta: .100 (minimal), .243 (typical), .371 (substantial)

*p < .05

Comparing Scales across Two Points in Time

A series of Wilcoxon matched pair signed rank tests (the non-parametric equivalent of a paired t-test) were conducted to understand if respondents exhibited any change in NR or MA between any two of the three points in time (see Table 4.5 for details). This test compared the median value of a respondent’s NR or MA at one point in time with the same individual’s median score at a second point in time, testing for differences within the same respondent. Thus, only respondents who completed the relevant pair of questionnaires were included in each comparison.

None of the six Wilcoxon signed rank tests showed that the median MA or NR values were significantly different ($p > .05$) between any two points in time.

Table 4.5 Wilcoxon Signed Rank Tests of median Marine Attachment and Nature Relatedness between two phases.

Comparison	N	Test Statistic (z)	p-value	Standard error
MA Pre vs MA Post 1	42	465.500	.085	66.155
MA Pre vs MA Post 2	31	227.500	.080	37.111
MA Post 1 vs MA Post 2	26	69.550	.732	20.448
NR Pre vs NR Post 1	42	367.000	.592	63.438
NR Pre vs NR Post 2	29	191.000	.567	46.241
NR Post 1 vs NR Post 2	24	146.00	.909	34.995

Mdn = MA Pre-Dive 4.00; MA Post 1-Dive 4.25; MA Post 2-Dive 4.50; NR Pre-Dive 4.00; NR Post 1-Dive 4.00; NR Post 2-Dive 4.14

Comparing Scales across Three Points in Time

Friedman's tests (the non-parametric equivalent of the repeated measures analysis of variance) were conducted to understand if respondents showed any change in NR or MA across all three points in time. A total of 23 respondents completed all three surveys and could be included in the Friedman's test.

Respondents showed no statistically significant difference in Marine Attachment (Friedman's $Q = 4.141$, $p = .126$) or in Nature Relatedness (Friedman's $Q = .074$, $p = .964$) across the three points in time based on a significance level of $p < .05$.

Motivations and Perceptions

At each phase, students were asked to rank a given list of six items (their own motivations for diving and a separate ranking for what they think would be the most important motivations for divers in general) in order of importance, one being the most important and 6 the least important. If answered incorrectly (including missing responses, tied rankings and rankings off of the scale), the entire set was thrown out. In total 70% of the Pre-Dive responses to this question were valid and 45% and 47% of the Post 1 and Post 2-Dive (respectively) were valid.

The mode from each motivation category, at each period of time for both the respondent and the respondent's perceptions of other divers were accumulated (Table 4.6). Overall, *Adventuring* and *Sightseeing/Exploring* ranked as the most important reasons dive students reported for both themselves ('self') and for divers in general ('others').

Photography/Videography was consistently the third most important reason for diving ('self' and 'others'). Generally, *Collecting Data as a Citizen Scientist/Researcher* and *Harvesting Food* ranked as the least important reason for diving ('self' and 'others'), though *Collecting Data* ranked slightly higher for 'self' compared to 'others.' Dive students ranked *Harvesting Food* most commonly as the least important reason for diving (6th place), except three months after diving for 'others'—in this instance, *Harvesting Food* was ranked as 3rd or 4th, as mid-range importance.

Though generally ranking low, *Becoming a Marine Ambassador* was the most varied across time and between self and others. *Becoming a Marine Ambassador* ranked the highest (at 4th most important reason) for the dive student themselves directly after completing the open water dive, though dropped to the lowest importance for 'self' three months post dive.

Table 4.6 Ranks of the most important reasons for diving for one's self and others¹

Category	Self as a Diver			Other Divers in General		
	Pre	Post 1	Post 2	Pre	Post 1	Post 2
Harvesting Food	6	6	6	6	6	3 or 4
Adventuring	1	2	1	1 or 2	2	1
Becoming a Marine Ambassador	5	4	6	5	5 or 6	4 or 5
Sightseeing/Exploring	1	1	2	1	1	2
Collecting Data as a Citizen Scientist/Researcher	4 or 5	5	5	6	6	6
Photography/Videography	3	3	3	3	3	3

¹ Mode

1 = most important (dark shade); 6 = least important (light shade)

Tie in the high importance= yellow highlight; tie in middle importance = green highlight; tie in low importance = blue highlights

Qualitative Findings

In total, 80 dive students participated in the open-end portion of the questionnaires.

Twenty participants completed all three open-end portions of the questionnaires, 33 participants completed two of three, 27 participants completed one of three. Two respondents completed the closed-end questions in the Post 2-Dive questionnaires but did not answer the open-end questions, so a total of 155 open-end portions of questionnaires were completed (Pre-Dive n=73; Post 1-Dive n= 47; Post 2-Dive n=35).

(Q1)

How do scuba dive students describe the marine environment before and after the diver training?

Descriptions of the Marine Environment

Before the open water dive. Three primary ways in which respondents described the marine environment before they complete the open water dive emerged: previous ocean-related experiences, a general love of wildlife and spiritual experience. While the following themes appeared in responses from each phase of the dive training, they appeared more prominently in the Pre-Dive responses than the Post-Dive responses.

When asked to share a memorable experience they had, Pre-dive respondents either describe their experience in the marine environment (largely in terms of their activities or specific marine life encounters) with a focus on the logistics of the experience (where they were, who they were with, what they saw, felt, or smelled) rather than emotions or feelings. When asked to describe their favorite part of being in the ocean and why, pre-dive respondents largely

describe their general love of nature/marine life and how they spiritually situate themselves within the ocean environment.

Previous ocean-related experiences. Before the open water dive, respondents frequently describe the marine environment in terms of their previous experiences in and around the marine environment. Respondents share ocean-related activities in which they have taken part and specific encounters they have had with marine life.

Most respondents (89%) reported having prior experience at the beach or in the ocean. Recreational activities, coded as *Leisure Activities*, accounted for 34% of all responses in the **Exposure to Ocean** category in the Pre-Dive questionnaires. *Leisure Activities* included respondents' descriptions of engaging in ocean-related sports and recreational activities. Scuba diving and recreational harvesting activities, such as fishing or crabbing, were designated as separate codes.

When describing their experiences *Leisure Activities*, respondents more frequently associated the activity with the logistical elements, such as where they were (36% of *Leisure Activities* instances pre-dive co-occurred with *Travel, Vacation, Visit* and 23% with *In the Tropics*), who they were with (39% with *With Others*), what they saw, felt (tactile), or smelled (16% with *Sensory Input*). *Leisure Activities* was also accompanied by *Amazement and Awe* (20% of occurrences), which captured expression of 'joy', 'elation', and 'euphoria' within the **Emotional Experience** category. NBJune described that her ocean-activities influenced her feelings towards the marine environment:

“My first time snorkeling near a remote beach in Mexico. I was with my family, and it was one of the first times I swam in the ocean. The water was clear, and I

was amazed by all the beautiful marine life I saw. This is when I first discovered my passion for the ocean.”—NBJune Pre-Dive

In this example, NBJune described that her ocean-activities influenced her feelings towards the marine environment. Her experience of swimming and snorkeling in the ocean combined with amazement she felt in seeing marine life influenced her to ascribe a new, positive feeling (“passion”) to the marine setting. NBJune also contextualizes her experiences within a specific place (“beach in Mexico”) and with specific people (“my family”).

However, pre-dive respondents were more likely to describe their experiences around the ocean in terms of the spiritual satisfaction they gained rather than the emotional reactions. Indeed, 30% of *Leisure Activities* co-occurred with *Spiritual Fulfillment* within the **Spiritual Experience** category, versus the 20% of *Amazement and Awe* within the **Emotional Experience** category. *Spiritual Fulfillment* was invoked when respondents described ocean-related activities as ‘fun’ or as something they ‘loved to do’. Before the open water dive, DWApril describes her love of exploring the intertidal zone:

“Visiting tidepool environments is one of my absolute favorite things to do. I much prefer doing so with family or friends like this last summer in July I went to Devil’s Punchbowl for an extremely low tide. . .” –DWApril, Pre-Dive

DWApril describes her love of exploring the intertidal zone. She not only notes partaking in an activity, but described the activity of tide pooling as one of her “absolute favorite things to do.” Having fun and enjoying oneself differs from the elements that appear in **Emotional Experience**—enjoyment relates to the satisfaction of having a need (in this case, joy) fulfilled. Pre-dive respondents, like DWApril, associate these ocean-related activities with a sense of fulfillment with their view of the marine environment.

Besides *Leisure Activities*, another component of previous ocean-related experiences arose in the **Relationship with Marine Life** category as *Personal Encounter with Marine Life*. This code was invoked when respondents describe intimate encounters of marine life and accounted for 28% of all responses coded under the **Relationship with Marine Life** category in the pre-dive questionnaires. *Personal Encounter with Marine Life* encapsulated pre-dive respondents' descriptions of encounters with an individual creature or a more intentional encounter with marine life, in which the respondent was actively searching for or investigating, rather than passively viewing, marine life (which would have been coded as *Passive Viewing of Marine Life*). Pre-dive respondents more often described these specific encounters (*Personal Encounter with Marine Life*) than they did general marine life viewing (*Passive Viewing of Marine Life*). In the pre-dive questionnaire, HHNovember provides an example of *Personal Encounter with Marine Life* in which they describe intentionality in seeking marine life, even though they do not report on a specific encounter with an animal:

“I usually go snorkeling at the ocean when we do visit. I’d be with family, but I’d spend way more time in the water than anyone else. My parents would have to fish me out. I loved searching for animals and never wanted to leave.”

–HHNovember, Pre-Dive

DVMarch describes a very specific memory in which she got a close-up view of an individual animal:

“I remember snorkeling and [free] diving with my father from the shore on the Black Sea. I also remember one time free diving on my own and finding a fish nest with a small fish guarding her eggs. That was super exciting.” –DVMarch,

Pre-Dive

Pre-dive respondents reported specific encounters with or actively seeking marine life more often than they reported general viewing of marine life. This distinction ‘seems to indicate that perhaps’ the intentionality and specificity of these ocean/marine-life-related encounters are more prominent than general encounters in the mental models pre-dive students have of the marine environment.

General love of wildlife. Another common theme the pre-dive respondents discussed was a general interest in wildlife, which was coded as *Love of Wildlife* and accounted for 46% of all occurrences in the **Relationship with Marine Life** category. In this case, respondents described their interest in or love for wildlife and marine life in two ways: as a motivation for wanting to learn how to dive or as one of their favorite aspects of being in the ocean. In his pre-dive survey, DTNovember’s responses capture both sentiments:

“I want to learn how to dive because marine life fascinates me and I want to have more first hand experiences with it” and “seeing all the different life below the sea.”—DTNovember, Pre-Dive

In this case, pre-dive students described the marine environment in terms of their general interest in wildlife. These responses reveal students’ perception that the ocean is a means to pursuing their interest in wildlife. There is also embedded assumption that the marine environment not only contains marine life but that the marine life is interesting or unique in some way and that it will be viewable/accessible to the participant if they descend below the surface. Pre-dive students discussed specific encounters with marine life and a general interest in wildlife, but less frequently discussed general encounters with marine life.

Love of Wildlife before the open water dive appeared alongside *Interest in Marine Ecosystem* and *Underwater Frontier* in equal frequency, each coupled with *Love of Wildlife* in

24% of instances. *Interest in Marine Ecosystem* in the **Relationship I have with Marine Environment** category distinguished interest in the ocean environment, which encompasses abiotic elements, from interest exclusively in the biotic elements. *Underwater Frontier* (also under the **Relationship I have with Marine Environment** category) in conjunction with *Love of Wildlife*, encapsulated perceptions that the ocean setting below the surface can provide opportunities to view wildlife beyond those opportunities accessible from the surface. JLNovember's response provided an apt example of all three codes (interest in marine life and the marine environment and exploring below the water surface):

“The ocean and marine life are very important to me. I have always wanted to learn to dive and see this life ‘under the sea’. Plus it just looks like it is totally fun!” –JLNovember, Pre-Dive

MGOctober exemplified the co-occurrence of having a fondness for wildlife and desire to see what is below the surface—the impression that the wildlife below the surface possesses value that is worth pursuing.

“Watching wildlife, scenery. It's so different from anything found on land and has so much biodiversity.”—MGOctober, Pre-Dive

Spiritual experience within the marine environment. Students described the marine environment in terms of their ‘spiritual positioning’ within in the environment. The category **Spiritual Experience** included respondent's descriptions of their non-physical/meta-physical experience of being in and around the ocean. Participants, at times, described that being in and around the ocean gives them *Spiritual Perspective*, as heightened/alterd/enhanced sense-of-self such as being part of something bigger than themselves (extrospection); subordinate to the

ocean's power; an atypical visitor to the underwater environment. Or the ocean gives them *Spiritual Fulfillment*, such as enjoyment, freedom or adventure.

Students on either side of the scuba experience gave responses that fell under **Spiritual Experience**, however, pre-dive students displayed a greater focus on their *Spiritual Perspective* to the marine environment than the post-dive students (36% and 27% of **Spiritual Experience** occurrences, respectively). These elements convey a sense of going beyond the confines of one's individual self—putting one's humanity in a new perspective by spending time in/near the ocean. These concepts are distinct from being at peace, stress-free, and calm (*Calm*) because (though they co-occur at times) the *Spiritual Perspective* responses are less emotional and more philosophical. Similarly, *Spiritual Perspective* not necessarily identity-related, as are some themes within the **Relationships I have with the Ocean**, rather, more related to how the respondent relates to the larger social/global narrative. For instance:

“I feel like I am in a foreign world, where I am no longer the majority or most powerful. Nature is completely in charge.”—ZSMarch, Pre-Dive

“Feeling connected to something more because you are surrounded and for once could be in danger just because humans don't belong there we just enjoy visiting.”—KSJune, Pre-Dive

ZSMarch described that being in and around the ocean gives her the sense that humans are not dominant actor in the human-ocean relationship and that the water is not human's native element. KSJune echoed ZSMarch, but also described the temporary condition of visiting the underwater environment and a sense of interconnectedness with the setting.

These themes of *Spiritual Perspective*, *Leisure Activities*, *Love of Wildlife* and *Personal Encounter with Marine Life* were primary ways in which dive students described their perspective of the marine environment before experiencing the open water dive.

After the open water dive. After the open water dive, respondents described the marine environment primarily in terms of their physical experiences within the marine environment, general marine life encounters and seeing marine life *in situ*.

Physical experience within the marine environment. Directly after the open water dive, students discuss the marine environment in terms of their physical experience of being within the marine environment to a greater extent than before or three months after the open water dive. Specifically, in this category (**Physical Experience**), Post 1-Dive respondents reported the physical experience of being in and around the marine environment in terms of *Other Worldly* and *Unpleasant* (whereas Pre-Dive and Post 2-Dive, the dominant physical experience was sensory input of the smells, sights, and sounds of the ocean, coded as *Sensory Input*).

Directly after the open water dive, respondents describe the marine environment as other worldly and as contrasting with the terrestrial experience (*Other Worldly*). *Other Worldly* accounted for 57% of all responses in the **Physical Experience** category Post 1-Dive and included properties that might otherwise only be experienced in outer-space: anti-gravity (floating or flying), assisted breathing or alien life (descriptions of marine life as other worldly or at its core, different from terrestrial life). The following are two examples of *Other Worldly* directly post-dive:

“All of the different, organisms, it’s like an alien planet!”—ZSMarch, Post 1-Dive

“You float easy! Stuff to see and do. Different than the Oregon woods.”—

EJOctober, Post 1-Dive

ZSMarch and EJOctober captured this *Other Worldly* perspective of the marine environment by describing marine life, floating and different-than-on-land-environment. Indeed, they both emphasized the ‘other-ness’ that many respondents described soon after diving in the open water—a sensation they did not experience to such a great extent in their ocean-related encounters before or three months after diving.

Another aspect of **Physical Experience** that made a prevalent appearance in the Post 1-Dive questionnaire was *Unpleasant*. This code captured respondent descriptions of negative physical experiences in the water, such as the uncomfortable effects of pressure, sensory deprivation, the cold, or claustrophobia. For instance, RRJanuary relayed her physical experience of the low water temperature:

“The most memorable part was honestly the cold. On each dive I was shivering within minutes until dive 4.”—RRJanuary, Post 1-Dive

And DVMarch describes her impression of the turbid underwater environment:

“I could not see anything. it was very frightening, because I did not know what to expect and, in addition, I could not see absolutely anything.”—DVMarch, Post 1-Dive

RRJanuary and DVMarch both conveyed their *Unpleasant* physical experiences, whether in discomfort (though shivering while diving can be much more serious than merely uncomfortable) or disorientation. *Unpleasant* physical experiences in or around the ocean were rarely reported before the open dive and three months after, but was widespread directly after the open water dive. *Unpleasant* accounted for 18% of all **Physical Experience** occurrences in the

Post 1-Dive responses, compared to 2% and 0% in the Pre and Post 2-Dive questionnaires, respectively.

After diving marine life encounters. After the open water dive, respondents described the marine environment also in terms of encounters with **Relationship with Marine Life**, both general encounters (*Passive Viewing of Marine Life*) and encountering marine life explicitly in its natural habitat (*Marine Life In Situ*). These two themes appeared more prevalently post-dive than pre-dive. *Passive Viewing of Marine Life* accounted for 41% of post-dive **Relationship with Marine Life** responses compared to 19% of pre-dive responses and *Marine Life In Situ* accounted for 20% of post-dive **Relationship with Marine Life** responses compared to 0% of pre-dive responses. First, after the open water dive, respondents more frequently catalogued their sightings underwater (*Passive Viewing of Marine Life*):

“We saw a shipwreck, tire reef, and lots of fish and crabs. We entered from shore and I had a lot of fun.”—BKApril, Post 1-Dive

“Seeing all of the biodiversity and hundreds of organisms.”—ECOctober, Post 1-Dive

“I was just blown away by. . .how much wildlife I saw everywhere (various fish, birds, turtles, snakes, etc.).”—HSDecember, Post 2-Dive

These respondents exemplified the post-dive pattern of listing the various types or quantities of organisms they witnessed underwater. BKApril’s response exemplified a common co-occurrence in which *Spiritual Fulfillment* co-occurred in 24% of *Passive Viewing of Marine Life* instances post-dive.

Second, post-dive respondents commonly described seeing marine life *in situ* as illustrated in these examples:

“Getting to be down with the fish in their little world.”—DHAugust, Post 2-Dive

“I really enjoyed seeing the marine life in its natural habitat, b/c I have only seen some of those species out of their natural habitat.”—SMApril, Post 1-Dive

“Going through a forest of anemones with my group and watching the recoil when we got close. It was like we were a guest in their environment yet still acknowledged.”—SADecember, Post 1-Dive

All three respondents not only reported seeing marine life but also *explicitly* referenced seeing the animal in its environment. Respondents before the open water dive also report seeing and encountering marine animals, but reports of seeing *Marine Life In Situ* was unique to the descriptions of the marine life after the open water dive. Though post-dive respondents did not explain *why* they thought seeing marine life in its natural environment was interesting or important, there was a pointed shift from pre-to-post dive.

Consistencies over time. As described above, there were numerous differences between how dive students describe the marine environment before and after the open water dive, however, there were also similarities. Regardless of dive-training stage, divers describe the marine environment as a place unexplored (*Underwater Frontier*) and unique (*Interest in Marine Ecosystem*), that is a place a place of tranquility (*Calm*).

As discussed earlier, *Underwater Frontier* commonly co-occurred with *Love of Wildlife* in the pre-dive responses. Post-dive, *Underwater Frontier* did not have this similar co-occurrence as pre-dive, but it appeared as a dominant theme in the **Relationship with Ocean** category as it did before the open water dive (69% of occurrences in the **Relationship with Ocean** category post-dive, 52% pre-dive). *Interest in Marine Ecosystem* also appeared in similar

frequency after and before (17% of occurrences in the **Relationship with Ocean** category post-dive, 23% pre-dive).

Another theme that students on either side of the training discussed the marine environment as a place of *Spiritual Fulfillment*. This theme of enjoyment appeared in high frequency in Pre, Post 1, and Post 2 accounting for 64%, 81%, and 62% all **Spiritual Experience** occurrences, respectively. However, despite an increase in negative physical experiences (*Unpleasant*) directly after the open water dives, *Spiritual Fulfillment* saw an increase.

Finally, *Calm*, *Wonder*, and *Excitement and Exhilaration* was a common way to describe the feeling of being in the marine environment across stages. The ocean as a place of *Calm* accounted for 26% and 36% of **Emotional Experience** occurrences pre and post dive, respectively. *Wonder* accounted for 20% and 18% of **Emotional Experience** occurrences pre and post dive, respectively. *Excitement and Exhilaration* accounted for 16% and 11% of **Emotional Experience** occurrences pre and post dive, respectively.

(Q2a)

How do scuba dive students describe the experience of diving before and after the diver certification process?

Descriptions of the Dive Experience

Before the open water dive. Before the open water dive, respondents described their view of diving as an opportunity for growth or Motivated by Gain, whether to gain skills, pursuing leisure, and/or deepening relationships with the marine environment.

Motivated by gain. Respondents described learning to dive in the pool and eventually in the open water as an opportunity to gain *something*—whether in the form of personal growth and gain of skills or in a new recreational hobby and an accomplished goal. The most commonly

cited types of **Motivated by Gain** were consolidated into three codes: *Personal Growth*, *Relationship with the Ocean* and *Leisure Pursuit*. *Personal Growth* included descriptions of scuba diving as a skill set that could open up job opportunities, support a pursuit of learning, progress existing skills and/or align with a degree program. *Relationship with the Ocean* accounted for descriptions of scuba diving as a means to pursue a relationship with the marine environment, generally either students seeking a new relationship or to deepen/strengthen their existing relationship with the marine environment through. *Leisure Pursuit* included descriptions of scuba diving as a fun recreational pursuit and as a lifelong goal to be check off the ‘bucket list’.

Nearly 90% of instances (104 of 117 instances) of **Motivated by Gain** occurred in the Pre-Dive responses and were aspirational (as in, scuba diving will hopefully help me gain X). The only instances of **Motivated by Gain** in the Post-Dive realm were affirmational in nature (as in, scuba diving is indeed a way to gain X). Before the open water dive, *Personal Growth* accounted for 44% *Leisure Pursuit* 33%, and *Relationship with the Ocean* 23% of occurrences in the **Motivated by Gain** category.

Before the open water dive, **Motivated by Gain** responses were at times as simple as one to two-word statements. For instance, *Leisure Pursuit* and *Spiritual Fulfillment* were frequently found together and RBNovember exemplified this duo succinctly:

“For fun and recreation.”—RBNovember, Pre-Dive

In this case, RBNovember simply considered scuba diving as a chance for enjoyment and leisure. This pairing of *Leisure Pursuit* and *Spiritual Fulfillment* accounted for 23% of *Leisure Pursuit* occurrences (8 of 35), conveying that respondents hoped scuba as a recreational activity would provide some sense of fulfillment, whether enjoyment, freedom, or adventure. There is, however,

an inherent overlap between the two ideas—*Leisure Pursuit* arguably has spiritual fulfillment built into it. Recreation is a pursuit of pleasure, or adventure, or relaxation, so it is logical that the two codes would co-occur.

The theme of scuba as an opportunity for *Personal Growth* did not occur in isolation. Scuba as means of *Personal Growth* before the open water dive co-occurred with *Underwater Frontier* (20% of occurrences). Example of *Personal Growth* with *Underwater Frontier*:

“To spend more time underwater and to explore deeper. (Also, I want to become an astronaut and scuba is a great way to learn about oxygen management and life support).”—RPSeptember, Pre-Dive

In this example, RPSeptember described scuba diving as an opportunity to pursue a career goal, learn new skills and to satiate a desire for discovery underwater. In this case, as opposed to the broad statement from RBNovember in the previous example, RPSeptember had a very specific vision of what scuba diving could provide him—and not just his current self, but his future self.

Relationship with the Ocean is the final theme of the **Motivations as Gain** to explore. Some students saw scuba as a chance to evolve or develop their *Relationship with the Ocean*. Respondents often prefaced *Relationship with the Ocean* (the relationship they wish to have) by describing the nature of their existing relationship with the ocean, as exemplified by MDJuly:

“I LOVE the water. Open h20 swimming, swimming laps, surfing, SUP, snorkeling, rivers, lakes, hot springs, the ocean. . . I’ve had amazing experiences in/around water, and the wildlife it nourishes, and want to explore it more deeply. . .”—MDJuly, Pre-Dive

In this example, MDJuly described scuba diving as the opportunity to enhance his current relationship with the ocean, particularly his love of all-things-water. He expressed an existing

connection with the marine environment and his pursuit of water-related activities and described scuba diving as an avenue to add new depth to this relationship. *Relationship with the Ocean* commonly appeared alongside water activities as though these activities served as the tool with which respondents could build a connection between the ocean and themselves. In fact, *Relationship with the Ocean* co-occurred with *Leisure Activities* in 31% of occurrences (8 of 26).

Before the open water dive, respondents described their perception of diving as an opportunity for growth or **Motivated by Gain**. Then next section shifts to explore how respondents view scuba diving after the open water dive.

After the open water dive. After the open water dive, respondents described their dive experience in terms of the **Rewarding Aspects of Diving**. Specifically, persevering through challenges, sharing the experience with the dive community, and gaining access to new experiences through their newly found diving skills.

Rewarding aspects of diving. After the open water dive, divers described the challenges and successes they encountered during the dive. *I Stuck with It* encompasses the pairing of these two concepts—most often new divers described facing challenges of diving (physical and emotional) then persevering over those challenges and continuing to dive (or ‘sticking with’ diving). Fittingly, *Perseverance* co-occurred with *Challenges, Scared and Nervous*, and *Skill Demonstration* most often, accounting for 55, 41, and 27% of all occurrences of *I Stuck with It* in the post dive surveys, respectively.

Also, after the open water dive, divers described scuba diving in terms of finding community or friendship and sharing the experience of diving with others. *Camaraderie* denoted the combination of discovering community through diving and appreciating the bond that forms

from sharing the impactful experience of diving with another person. DVMarch illustrates most of these themes in when she described her first experiences of diving in the open water:

“I was in a group since it was my certification the most memorable dive was the very first one in the open water. viz [visibility] was 2 feet, I could not see anything. it was very frightening, because I did not know what to expect and, in addition, I could not see absolutely anything. still, I had to drop down and do my first skills. I clearly remember my instructor. maybe because I could not see anything else do to the conditions :) however, I'm really grateful to my instructor for helping me to get through this experience. I feel a deep connection to my buddies and my instructors/master scuba. I did not expect that diving is such a uniting activity.”—DVMarch, Post 1-Dive

In this response, DVMarch captures persevering over challenges (*Perseverance and Challenges*) and nerves (*Scared and Nervous*) while executing the required underwater skills (*Skill Demonstration*). She also describes the meaningful connection she made with her dive buddies and instructors, with whom she could share the dive experience (*Camaraderie*). As exemplified in the excerpt, scuba diving can hold challenges for the new diver but it can also offer **Rewarding Aspects of Diving**, such as perseverance and camaraderie.

At times, *Camaraderie* was coupled with a sense of *Spiritual Fulfillment*. Indeed, *Spiritual Fulfillment* co-occurred in 24% of all *Camaraderie* occurrences post dive (8 of 34), as shown by LMSeptember:

“I went Scuba Diving in the great barrier reef. I was with my best friend on a livaboard It was so much fun, adventurous, and relaxing.”—LMSeptember, Post 2-Dive

In this case, LMSeptember described that since getting scuba dive certified, he went diving with a friend and felt a sense of fulfillment through adventure and enjoyment. The respondent put the experience of post-certification diving in a social context. His diving experience is cognitively situated within his sense of *Camaraderie* and *Spiritual of Fulfillment*.

Furthermore, after the open water dive, divers explained another **Rewarding Aspects of Diving**. Their newly acquired scuba skills gave them access to new experiences from which they would otherwise be barred, as denoted by the theme *New World Opens Up*—whether this means access to new territory or to the next level of diving. Three months after becoming dive certified, BKApril described his perspective of diving:

“My favorite part was diving in the open water and experiencing a whole new world. I felt as if I had discovered a whole new universe that I can explore that I am scuba certified.”—BKApril, Post 2-Dive

BKApril described that diving gave him access to territory where he would otherwise not have access. As he illustrates, the concept of ‘territory’ or place to which he has now gained entry, is beyond this Earth, indeed, “*a whole new universe*” under the water that BKApril can now investigate.

In many cases such as this *New World Opens Up* occurred with *Other Worldly* (35%) or *Underwater Frontier* (30%). The activity of scuba diving transforms from being a *Leisure Pursuit* or opportunity for *Personal Growth* to being a vessel for transporting divers to a life of extraordinary exploration and discovery. Not only is the marine environment more accessible, but a “*world of opportunities open[s] up*” (LNJanuary, Post 1-Dive) and the sub-surface environment becomes “*a whole new world*” (JWAugust, Post 1-Dive) primed “*for exploration and adventure*” (JLNovember, Post 1-Dive). This sentiment was repeated across respondents

post open water dive—13 of 59 post-dive respondents (22%) describe that diving in one or more of these terms.

(Q2B)

How do scuba dive students describe their relationship with the marine environment after the diver certification process?

Relationship with the Marine Environment

Three months after the open water dive. Three months after the open water dive experience, respondents were asked whether they thought their relationship with the marine environment had changed since learning to dive. Naturally, divers reported either that their relationship had changed or that it had not changed. This category, **Relationship with Ocean Since Diving**, had two codes, either the diver reported their relationship *Has Changed* or *Has Not Changed*. On the surface, 10% of responses showed that their relationship with the ocean has not changed since diving, however, after her initial response of ‘has not changed’ one respondent proceeds to describe that she has reconnected with the marine environment through diving. Thus, 8% of responses indicated that the respondent did not believe their relationship has changed and 92% believed that their relationship had changed.

Respondents who reported change, described a change in three primary ways: a general *Increased Connection*, a *Greater Appreciation*, and heightened sense of *Responsibility* for the marine environment. Of these themes *Increased Connection* accounted for 47% of all instances of reported change in relationship, with *Greater Appreciation* at 34% and *Responsibility* at 19%.

Summary of Key Findings

This chapter presented detailed findings from the responses given by participating Open Water Diver students. The main findings from analysis of both the quantitative and the

qualitative data sets are summarized in Table 4.7 to provide a brief overview of the findings and bring the findings from both data sets together in one space.

Table 4.7 Summary of key findings from the analysis of the quantitative and qualitative data sets.

Nature Relatedness and Marine Attachment:

- Mean Marine Attachment (MA) and Nature Relatedness (NR) scores increased slightly at each point in time and showed positive centrality of MA and NR.
- No significant differences in MA or NR between any two points in time nor across all three points in time.

Motivations:

- Adventuring, sightseeing and exploring ranked as highest importance for why they chose to dive with harvesting food as generally of least importance.
- Generally ranked own reasons for diving as similar to why others may dive; except collecting data as a citizen scientist or researcher ranked as slightly more important to self than others.

Descriptions of the Marine Environment:

- Before the open water dive, respondents described the marine environment in three primary ways: previous ocean-related experiences, a general love of wildlife and spiritual experience.
- After the open water dive, respondents described the marine environment: in terms of physical experiences, general marine life encounters and seeing marine life *in situ*.
- Both before and after the open water dive, respondents described the marine environment as an interesting ecosystem is like an unexplored frontier and a place of enjoyment and tranquility.

Experience of Scuba Diving:

- Before the open water dive, respondents described their view of diving as an opportunity for growth, whether in terms of gaining skills, pursuing leisure, and/or deepening relationships with the marine environment.
- After the open water dive, respondents described their dive experience in terms of the rewarding aspects of diving. Specifically, persevering through challenges, sharing the experience with the dive community, and gaining access to new experiences through their newly found diving skills.

Relationship with the Marine Environment:

- After diving, most respondents self-reported that their relationship with the marine environment has changed since diving: increased connection, greater appreciation and a greater sense of responsibility towards the marine environment.
-

CHAPTER 5 DISCUSSION

The purpose of this mixed methods study was to explore how institutionalized scuba dive training/certification and the diver experience influences the diver's nature relatedness and connection to the marine environment, through the lens of divers-in-training in Oregon. This chapter comprises a discussion of the main findings pertaining to the ways in which divers describe the marine environment and their relationship to the marine environment overtime as related to the literature on nature relatedness, social construction of landscapes and schema theory and the implications of these outcomes to the dive training practitioners and researchers. This chapter concludes with a discussion of the limitations of this study and future research.

The guiding questions of this study are:

- (Q1):** How do scuba dive students describe the marine environment before and after the diver training?
- (Q2):** How do scuba dive students describe the experience of diving and their relationship with the marine environment?
- (Q3):** What are scuba dive student's nature relatedness, values of the marine environment, perceptions of the dive community and motivations for diving before, after and three months after the open water dive experience?

Interpretation of the Findings

(Q3)

What are scuba dive student's nature relatedness, values of the marine environment, perceptions of the dive community and motivations for diving before, after and three months after the open water dive experience?

Nature Relatedness. Based on the findings of high overall Nature Relatedness scores, this particular group of new divers entered the dive training program already possessing a connection to nature that did not change significantly after the open water dive experience. According to Nisbet et al. (2009), a high Nature Relatedness score indicates a greater concern for

the environment, pro-environmental attitudes and behavior, as well as more propensity to view environmental issues in earnest. Based on this assessment from Nisbet et al., (2009), “those most related to nature. . . demonstrate this in concrete behaviors such as spending more times outdoors in the natural environment” (p. 720). It follows then, that participants in a scuba dive training course, presupposed to spend time outdoors in a natural setting, would indeed have a higher NR scores from the outset.

However, participants’ NR scores failed to show the nuances and complexities of the scuba dive students’ relationships and connections to the marine environment across the three points in time during dive training that were revealed in the free responses.

Marine Attachment. As previously reported, participants in this study showed an overall positive place attachment to the marine setting that increased slightly across each phase. Though not considered statistically significant, this increase shows that some element of respondent’s sense of attachment to the marine environment was heightened during the dive training process.

As Kyle et al. (2004) described in the context of leisure studies, place attachment has two dimensions: place identity and place dependence. The former considers place as it is internalized and integrated into an individual’s sense of self, while the latter considers place as it pertains to fulfilling an individual’s goals (functionality) (Kyle et al., 2004). In the context of this study, while the place attachment instrument used cannot differentiate between place identity and place dependence, the free-response data supports that both place (‘marine’) identity and dependence were nurtured during the dive training process. For instance, respondents described scuba as a means to deepen their relationship (place identity) with the marine environment (*Increased Connection, Part of Identity, New World Opens Up*) and that the marine environment as means

to attain their goals (place dependence) of seeing marine life and scuba diving (*Marine Life In Situ, Personal Growth, Leisure Pursuit*), supporting the increase in Marine Attachment.

Motivations, Perceptions and Expectations. As explained in chapter 3, dive students were asked to rank a pre-set list of options of reasons to dive, in the order of most of the most important to least. This preset list was developed based on verbiage from the Open Water Diver training manual (PADI, 2015) and while the question gave insight into why students might have been motivated to dive, there were many additional motivations revealed in the free responses (such as gaining skills, reaching goals, seeing marine life, forgetting the stresses of life). Similarly, Todd (2002) found six primary diver-reported motivations—personal challenge, stature, escape, learn, adventure, and social interaction—which might have served as a better metric for measuring motivations. And as Meisel-Lusby and Cottrell (2008) found, motivations for diving change depending on diver experience level.

In previous literature of scuba diver perceptions, authors have ranged from diver perceptions of the dive site quality and crowding to perceptions of the impact of scuba diving to social perceptions of scuba as a high-risk sport. However, in this study, dive student perceptions of the scuba community itself was explored briefly. The findings support that overall, this group of dive students perceived the rest of the dive community as holding similar goals as themselves—even overtime, as dive students progressed through the course alongside members of the dive community. This suggests that dive student's expectations of the dive community were largely met which is a key facet of visitor satisfaction (Manning, 2011).

As reported in the findings, there were two instances that showed a discrepancy between other divers and self. Consistently across each point in time (before, directly after, and three months after the open water dive), dive students appeared to view other divers as slightly less

likely to be interested in collecting data than themselves. This could be influenced by the particular population of dive students that participated in the study as the dive training programs were located in close proximity to universities. Also, the sharp increase of the importance of harvesting food for other diver three months after the open water dive remains unexplained and merits further investigation.

(Q1): How do scuba dive students describe the marine environment before and after the diver training? (Q2): How do scuba dive students describe the experience of diving and their relationship with the marine environment?

Creating Oceanscapes. Overall, when describing the marine environment, dive students contextualize the marine environment through their own past experiences. Such contextualizations were typically displayed as marine-related memories or experiences in a specific place, with specific people or participating in specific activities. In drawing upon these social constructs to describe the marine environment, respondents show that the marine environment has transformed from a physical space to an *oceanscape* embedded with meaning, just as the terrestrial setting embedded with social, symbolic meaning might be transformed into a landscape (Greider & Garkovich, 1994). Dive students, before and after diving, talk about the marine environment as an *oceanscape*.

As described in the findings, the ways in which these dive students describe the *oceanscape* showed differences before and after the open water dive, but how might the dive training or dive experience factor into how new divers are conceiving the *oceanscape* or what process might be invoked to stimulate a shift? But as seen in the findings, a shift did not *always* occur after the dive (such as the sense of *Calm*), so what process may account for shifts as well as continuities in diver conceptualization of the *oceanscape*?

Schema and Disequilibrium. Turning to Piaget's theory of cognitive development, humans learn and understand the world through continual processes of construction, destruction and reconstruction of our mental maps—these mental maps, called schemata, come together to form an individual's view of the world (Wadsworth, 1996). For cognitive development to occur, the individual needs to interact with his or her environment, either physically or mentally, and disrupt existing schema into disequilibrium (Piaget, 1952). In other words, the presence or presentation of new knowledge is not enough to spark development—the learner must engage with the knowledge through action and unbalance, so to speak, an existing schema.

To reiterate, in schema theory, there are two primary factors that are needed to cause disequilibrium: new knowledge and action. In the context of a beginning dive course, dive students are provided knowledge and are required to act upon that new information. Thus it follows that if the dive training omitted one of those elements, dive students would not leverage disequilibrium.

During the dive training process, dive student are presented with different types of knowledge (much of which is presumably new, otherwise the dive students would not be beginner dive students). Piaget delineates three main types of knowledge: physical, logical-mathematical, and social. The physical pertains to the shape, size, feel, or other properties of physical objects, conceived through discovery (Wadsworth, 1996). Logical-mathematical knowledge is “constructed from the *actions*” (p. 23) of the individual on the object, conceived through invention, and finally, social knowledge is cultural norms acquired through social interaction (Wadsworth, 1996).

There are numerous ways these three types of knowledge are presented during the dive training course—from in-class written and aural lectures to the practical exercises in equipment

preparation and confined and open water dives to interactions with dive training staff and peers—accompanied by numerous opportunities for dive students to act upon the inflow of knowledge. Although analysis of dive course materials and proceedings was outside the scope of this study, I acknowledge that these different forms of knowledge/action exist in dive training.

After knowledge, action and disequilibrium arise, the mind works to return the schema to equilibration (Wadsworth, 1996) in one of two ways: the knowledge is either assimilated or accommodated. Assimilation means that the information/experience aligned with an existing schema and is added to the collection, so to speak, reaffirming the schema or a particular view in a new or routine way (Piaget, 1952). Accommodation occurs if the information/experience does not align with an existing schema. In this case, either a new schema is created to house the information or, if the information conflicts with the schema or cannot be reconciled existing schema, the information is rejected (Piaget, 1952). As a reminder, schemata are hypothetical manifestations of the cognitive development process (Wadsworth, 1996), a dive student's schema of the *oceanscape* cannot not be physically examined to find evidence of assimilation or accommodation.

However, in this study dive students had the opportunity to explain and describe their experiences, memories, and thoughts in written form as a symbolic representation of their schemata (though I am constrained by what respondents chose to share and not to share). In the context of this scuba dive group, there were instances of both assimilation and accommodation evident.

Assimilation in Scuba. As described in the findings, both before and after the open water dive, participants expressed the *oceanscape* as a place to explore, fulfill interest in the marine ecosystem and a place of tranquility. This consistency across time and experience indicates that

participants started with three schemata of the *oceanscape* that included each of these three qualities. They gained information and acted on that information throughout the dive training process, including the open water dive that concluded the training, apparently, with those three schemata intact, as the concepts appeared in relatively stable frequencies over time. Thus it would appear that disequilibrium caused by the knowledge and dive students' interactions with that knowledge, was remedied or returned to equilibrium by accommodating the knowledge into the existing schemata.

Accommodation in Scuba. In this study, dive students exhibited signs of accommodating schema to align with new knowledge. One example drawn from the findings, dive students before the open water dive described their 'relationship-with-marine-life' schemata in terms of their personal encounters with marine life and their general love of wildlife. However, after the open water dive experience, respondents showed a shift in these schemata to accommodate seeing a myriad of marine life and seeing marine life *in situ*. In this case, some aspects of the schemata remained the same (personal encounters with marine life and general love of wildlife still make a prevalent appearance after the dive), but now the divers describe their 'relationship-with-marine-life' schemata to include viewing multitudes of marine life and seeing marine life *in situ*. This is an example of equilibration of schema through accommodation.

This study also revealed at least one instance of new information and action incurring disequilibrium that apparently could not be assimilated or accommodated in an existing schema, so the knowledge was rejected or an entirely new schema was created. Directly after completing their open water dive, negative physical experience appeared repeatedly, whereas before and three months after the open water dive the harshness and physical discomfort of the marine environment were nearly absent.

One possibility is that the experience of discomfort or negative associations were not part of the respondents' schema of the *oceanscape* before the open water dive and disequilibrium in the schema caused by the negative experience after the dive could not be accommodated or assimilated into an existing schema so the knowledge was rejected and thus, the near absence of discussion of a negative *oceanscape* schema three months after the dive.

Alternatively, the appearance of another set of knowledge/experiences could suggest a different narrative. Immediately after the open water dive, in addition to the appearance of negative physical experience, the concept of perseverance arose. Instead of the negative experiences being rejected outright, the data may instead show that the negative experiences could have been accommodated into another schema to create or modify the schema of perseverance (overcoming challenges) in the *oceanscape*. In other words, respondents reconciled their negative physical experiences/displeasure through the lens of overcoming a challenge and thus, after some time, revived their view that the ocean is a place of enjoyment. This example demonstrates that schemata are neither clearly delineated nor occur in isolation.

Implications

Beyond certification. The core of the diver training program, including safety and technical skills, are paramount to the dive training process and should not be compromised by peripheral elements of dive training. However, understanding the dive students within a given Open Water Diver cohort, while perhaps not the foremost priority, is of much more importance than peripheral. Understanding that scuba diving and dive training may influence more than just the student's skill set and also influence the student's schemata—which, when summed, form the student's view of the world—is worthy of discussion within the industry. Essentially, even though PADI dive students around the world will follow a standardized curriculum executed by

instructors (who have themselves been trained in a standardized manner), the outcomes go beyond reception of a certification card. Whether at the dive certification organization level or local dive program level, integrating this understanding into practice could be as simple as leaving space in the training process for students to periodically reflect upon their experiences and understandings either in self-reflections or group sharing. This would be a way for the program to acknowledge that training process is or can be embedded with more meaning for students than technical skills and could be particularly of use for instructors.

To elaborate, the cohort of dive students that participated in this study appeared to have a shift towards an increased interest in listing the types/quantities of life they saw, as well as interest in seeing the marine life in its natural habitat. Tapping into shifts such as this could give dive instructors means engage the students through their new schema, by, perhaps, encouraging students to include marine life sightings or observations in their dive log.

As another example, this particular dive cohort described little fear in their schema of the oceanscape before diving, then a sharp increase in negative talk (discomfort or ill-ease) immediately after the dive, only to have the negative descriptions disappear three months after the dive. Understanding common types of schema shifts new dive students may experience could equip instructors (who may be far removed from the new-diver experience) with the ability to address potential concerns early in the training process. Particularly in the Pacific Northwest, where diving conditions are challenging (limited visibility, cold water, strong currents) and offer inconsistent rewards (marine life many not visible at all, due to turbid conditions).

Conservation and awareness. PADI is one of many diver certification organizations that has shifted focus towards ocean health-related goal in the last twenty years. Most recently, PADI launched a social responsibility program comprising four-pillars of change, two of which directly

address marine-related themes: Ocean Health and Marine Animal Health. In addition to these pillars, the Open Water Diver course includes lessons on safe, appropriate encounters with marine life and briefly note ocean conservation issues. Understanding the emerging and established dive communities, including trends in schematic shifts that occur through the dive training process (particularly as they pertain to the marine environment), organizations such PADI can strategically provide marine or conservation related knowledge that might intentionally cause disequilibrium in the divers' schemata, to inspire assimilation or accommodation. Even one schema, shifted towards favoring ocean health, contributes to an individual's' worldview as a whole and can help advance PADI's goal of promoting a health marine environment.

Added value. Also, consideration for a new dive student's schema upon starting the dive training could provide added value to the diver's training experience. For instance, the group of new divers that took part in this study held an overall positive connection to nature and attachment for the marine environment upon entering the dive training program. Gathering such an understanding of the incoming students could help inform what support students may need or what additional resources students could be provided. As for this group, with a high nature relatedness and place attachment to the ocean, students may be interested in learning about local animal species or characteristics of local dive sites.

Oceanscape as a social construct. Considering that *oceanscapes* are socially constructed, the patterns and trends of how divers described the *oceanscape* as seen in this study will probably vary in different socio-cultural settings. It would behoove the dive training organizations to understand not only how their dive instructors and dive students view the *oceanscape*, but to understand and acknowledge how they (as an organization) view and project

their view of the *oceanscape* to partners, staff and divers worldwide. This is particularly pertinent for a diver certification organization such as PADI, which has a substantial global presence and works within the confines of regional regulations as well as customs and taboo specific to each locale.

Affordances and Constraints

There were several limitations and affordances in this study. This study was not intended to yield generalizable results, rather it was intended to address dive trainees in the Pacific Northwest. Also, the targeted scope of this study allowed a deeper exploration of the qualitative data and greater acuity to discrepancies or congruities between respondents and across time.

Furthermore, though dive students were given the opportunity to describe their experiences in a questionnaire, the free-response section was still composed of standardized prompts. The prompts were designed to promote reflection, but did not always achieve the intended goal. However, this study affords a more holistic understanding of this dive community—as using mixed methods captured both the broader trends and the more subtle shifts therein.

It was only after a concerted exploration of the data that schema theory and social construction of oceanscapes were illuminated and became defensible explanations for the patterns that emerged from the data. Even so, gaps in the existing theories remain to be filled, particularly in regards to understanding how emotion and affect are situated within the development or evolution of schemata.

Recommendations for Future Study

The following are some suggested avenues for future studies.

Affect. Much of what the dive students shared and described in their free responses was related to affect (feelings, motivations, interests). Schema theory is part of Piaget's broader cognitive development theory which seemingly does not provide a robust explanation of how, if at all, affect factors into schema development/adaptation. Wadsworth (1996) argued that affect develops in a separate yet congruous manner as cognition and viewed affect as a provocateur of the cognitive process. In the scope of this study affective and cognitive schema were treated similarly, though in future studies the role of affect in cognitive development or the qualities of the affective development should be explored.

Cross-cultural perspective. Considering that *oceanscapes* are socially constructed through language, symbols and culture, it stands to reason that the ways in which people of different cultural backgrounds construct their view of the marine environment would differ as well. As PADI's diver training curriculum is standardized and has a global reach, exploring how dive students around the world construct their view of the *oceanscape* would further inform the dive training implementation.

Alternative methods. Future researchers that seek to understand the dive community should consider incorporating individual or focus group interviews into the research design alongside a survey method. Interviews can allow for greater flexibility and for a more custom approach depending on the situation (Maxwell, 2013). Focus group interviews in particular can allow the researcher/interviewer to retreat to some extent and enable participants to take center stage and directing discussion along an unexpected path.

Concluding Remarks

The findings of this study provide a baseline understanding of the ways in which scuba dive training and diving may influence student's understanding of the marine environment, or perhaps more accurately, the *oceanscape*. The transformation from dive student to certified diver involves a more than gaining a certification card—in this community, the transformation involved nuanced, yet visible shifts within dive student's worldview. As members of the dive industry continue pursuing environmentally viable practices worldwide, they might also be capable of fostering ocean health within their very own communities of divers.

The findings also show the Nature Relatedness scale's inability to capture the shifts in the type, manner, and nature of the participant's connection to nature in light of their scuba dive experience and reveals a need for refinement or reconceptualization of such scales. As the adapted Place Attachment scale mean scores showed greater shifts than the mean Nature Relatedness scores, the Place Attachment scale may possess greater acuity to the changes and evolutions in the diver's connection to the marine environment and merits further investigation as a tool in this context.

Scuba diving is unlike other informal learning or recreational activities. Scuba diving takes people out of their terrestrial dwellings and literally immerses them, affectively and cognitively, in the experience of being in a non-native, aqueous environment. This total-immersive experience of scuba diving has yet to be fully explored by researchers. While divers draw upon socially constructed context and shared experiences with fellow divers to make sense of the dive, scuba diving is an all-encompassing, non-normative experience, enriched by the idiosyncrasies of the individual diver's perceptions.

Continued efforts in this field of research and collaboration with dive training programs have the potential to yield a greater understanding of how affect is situated with the incredibly rich practical and cognitive experiences of diving, specifically in regards to affect towards the marine environment.

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APPENDICES

Appendix A. Introductory Letter to Dive Programs

To Whom it May Concern,

My name is Kimberley, I am entering my second year as a master's student at Oregon State University (OSU), pursuing a degree in Environmental Sciences with a focus in Environmental Education. I am reaching out to you because of our shared passion for scuba diving and your clear commitment to exemplary dive training. I am seeking your support in my research study, which aims to explore how scuba dive students make meaning of their scuba dive experience.

Over the last 30 years, scuba dive certification organizations, such as PADI, have integrated concepts of marine education, conservation and stewardship into their diver training curriculum. In the fall of 2016, PADI launched a social responsibility campaign comprised of four-pillars of change: An Ocean Health Pillar, Marine Animal Protection Pillar, People and Community Pillar, and Healing and Wellness Pillar. Two of these pillars directly address marine themes which reasserts PADI's commitment to marine health. However, after extensive background research, I have found that there has not been any research looking at how divers feel about the marine environment or how the act of scuba diving might impact how they feel about the marine environment—which is very important to consider when designing curriculum.

WHAT AM I ASKING OF YOU? I am asking for your permission to seek volunteers from your Open Water Diver courses to participate in a survey before pool diving, after open water diving and three months after open water diving. After extensive background research, graduate-level courses and guidance from my advising professors, I have designed a survey to better understand how beginner divers value or perceive the marine environment before and after they become certified.

The survey should take about 15 minutes to complete and would be administered when convenient (beginning or after class time). I aim to start collecting data this summer (June) through winter (February). The study is not evaluative—the questions will not pertain to the dive program or instructors, rather, the experience of diving itself. All responses will remain confidential and participants are free to withdraw from the study at any time. Participants must be 18 years of age or older. Your organization will remain anonymous in any resulting papers or publications from this research. I will distribute the findings of this work to you, in your preferred format, upon conclusion.

If you have any questions about this research project, please contact: SueAnn Bottoms at SueAnn.Bottoms@oregonstate.edu or 541-737-8262.
Thank you for your consideration.

Sincerely,

Kimberley Preston, MS Student Environmental Sciences

Appendix B. Consent Form

Project Title: An Exploration of How Emerging Scuba Dive Students Make Meaning of the Scuba Dive Experience

Principal Investigator: Dr. SueAnn Bottoms

Co-Investigators: Kimberley Preston, Dr. Michael Harte, Dr. Shawn Rowe

Version Date: June 18, 2018

Greetings,

You are being asked to participate in a research study exploring how scuba dive students make meaning of their scuba dive experience. This research is being conducted by Kimberley Preston, for the completion of her Master of Science thesis. You have been approached because you are currently enrolled in the PADI Open Water Diver course and are 18 years of age or older.

If you agree to participate, you will be asked to complete a total of three surveys, to better understand dive student's perceptions, values and attitudes of scuba diving and the marine environment, before open-water dive portion of the Open Water Diver course, after completing the open water dive, and three months after completing the open water dive.

The first two surveys will be available in paper during the Open Water Diver course while the last survey will be available electronically about three months after the course. Each survey should take about 15-20 minutes to complete.

This study is not designed to benefit you directly. However, by completing the questionnaire, you will help us to better understand the scuba dive community and potentially inform future decision-making in dive curriculum.

Your participation in this study is voluntary and you will not be identified in the published research. Your information collected as a part of this research, even after identifiers are removed, will not be used or distributed for future research. Your participation or non-participation in this research will not have any impact on the relationship between you and the dive course. You are free to withdraw from the study at any time without penalty. You are free to skip any questions that you would prefer not to answer.

If you have any questions about this research project, please contact: SueAnn Bottoms at SueAnn.Bottoms@oregonstate.edu or 541-737-8262. If you have questions about your rights or welfare as a participant, please contact the Oregon State University Human Research Protection Program (HRPP) office, at (541) 737-8008 or by email at IRB@oregonstate.edu

Thank you for your participation.

Sincerely,

SueAnn, Kimberley, Michael and Shawn

I agree that I am 18 years of age or older; I have read and understand the informed consent information above and agree to participate in this research study.

___ No

___ Yes

If you selected yes, would you be willing to participate in a follow-up survey 3 months after your open water dive?

___ No

___ Yes. If yes, please provide your email

address: _____

Appendix C. IRB Approval Documentation



Oregon State University Research Office

Human Research Protection Program
& Institutional Review Board
B308 Kerr Administration Bldg, Corvallis OR 97331
(541) 737-8008
IRB@oregonstate.edu
<http://research.oregonstate.edu/irb>

Date of Notification	06/28/2018		
Notification Type	Approval Notice		
Submission Type	Initial Application	Study Number	8625
Principal Investigator	SueAnn Bottoms		
Study Team Members	Michael Harte, Kimberley Preston		
Study Title	An Exploration of How Emerging Scuba Dive Students Make Meaning of the Scuba Dive Experience		
Review Level	FLEX		
Waiver(s)	Documentation of Informed Consent		
Risk Level for Adults	Minimal Risk		
Risk Level for Children	Study does not involve children		
Funding Source	None	Cayuse Number	N/A

APPROVAL DATE: 06/27/2018

EXPIRATION DATE: 06/26/2023

A new application will be required in order to extend the study beyond this expiration date.

Comments:

The above referenced study was reviewed and approved by the OSU Institutional Review Board (IRB). The IRB has determined that the protocol meets the minimum criteria for approval under the applicable regulations, state laws, and local policies.

This proposal has not been evaluated for scientific merit, except to weigh the risk to the human subjects in relation to potential benefits.

Adding any of the following elements will invalidate the FLEX determination and require the submission of a project revision:

- Increase in risk
- Federal funding or a plan for future federal sponsorship (e.g., proof of concept studies for federal RFPs, pilot studies intended to support a federal grant application, training and program project grants, no-cost extensions)
- Research funded or otherwise regulated by a [federal agency that has signed on to the Common Rule](#), including all agencies within the Department of Health and Human Services
- FDA-regulated research
- NIH-issued or pending Certificate of Confidentiality
- Prisoners or parolees as subjects
- Contractual obligations or restrictions that require the application of the Common Rule or which require annual review by an IRB
- Classified research
- Clinical interventions

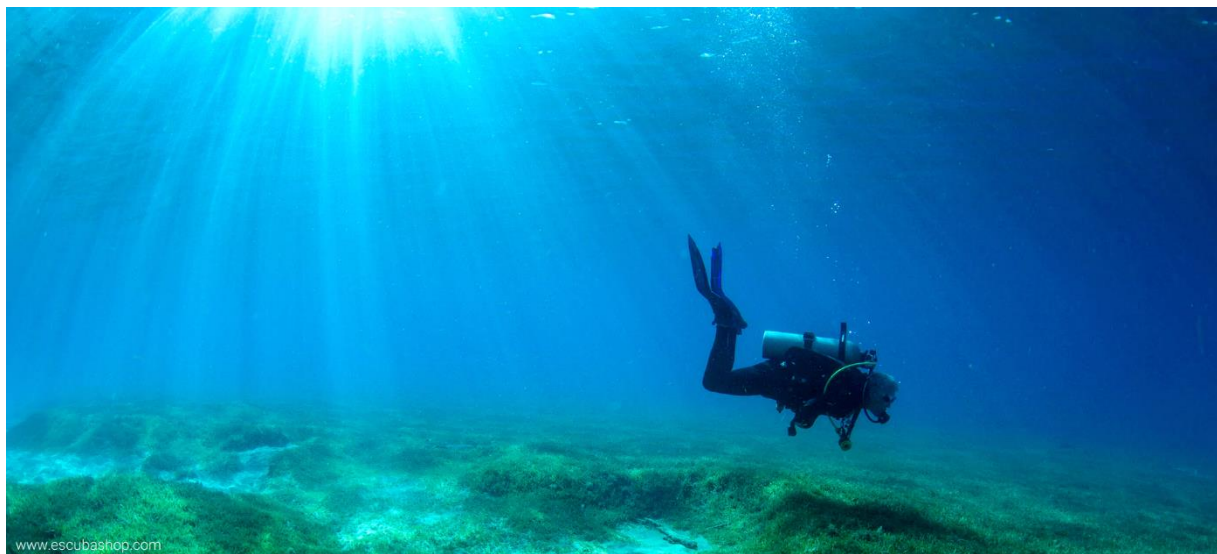
Principal Investigator responsibilities:

- Keep study team members informed of the status of the research.
- Any changes to the research must be submitted to the IRB for review and approval prior to implementing the changes. Failure to adhere to the approved protocol can result in study suspension or termination and data stemming from protocol deviations cannot be represented as having IRB approval.
- Report all unanticipated problems involving risks to participants or others within three calendar days.
- Use only valid consent document(s).
- Submit project revisions for review prior to initiating changes.

Appendix D. Questionnaires

Scuba Dive Students Making Meaning of the Dive Experience

Important Questions for PADI Open Water Diver Students



**Please Complete this Survey and Return to Field Researcher by the Next
Scuba Class Session.**

Participation is Voluntary and Responses are Confidential.

Thank You for Your Cooperation.

A Study Conducted By:



PRE-DIVE SURVEY

1. Please provide your first and last initial, the month you were born, and the state in which you are completing your open water certification (OR or HI). (Example: **Jane Smith** born in **April** completing her open water certification in **Oregon** would write: **JSAprilOR**)

First and last initials, month of birth, and state where you will receive certification: _____

2. To what extent do you disagree or agree with the following statements? (Circle one number for each statement that most closely matches your response).

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A lot of my life is centered around recreating in water (lakes, rivers, ocean...).	1	2	3	4	5
I get satisfaction from visiting water areas more than any other type of recreation area.	1	2	3	4	5

I don't understand why others care about marine environment.	1	2	3	4	5
I don't feel a commitment to the marine environment.	1	2	3	4	5

Some species are just meant to die out or become extinct.	1	2	3	4	5
Nothing I do will change problems in other places on the planet.	1	2	3	4	5

3. Why do you want to learn to dive? (If needed, extra space is provided at the end of the survey).

Continue Survey on Next Page→

4. What are some reasons why you want to participate in recreational scuba diving? What are some reasons why you think other people want to participate in recreational scuba diving? (Rank the following items for both yourself and what may be the case for others. 1 = most important reason; 6 = least important reason).

Reasons for Diving	Yourself as a Scuba Diver	Scuba Divers in General
Harvesting Food	_____	_____
Adventuring	_____	_____
Becoming a Marine Ambassador	_____	_____
Sight-Seeing/Exploring	_____	_____
Collecting Data as a Citizen Scientist/Researcher	_____	_____
Photography/Videography	_____	_____

5. To what extent do you disagree or agree with the following statements? (Circle one number for each statement that most closely matches your response).

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I enjoy being outdoors, even in unpleasant weather.	1	2	3	4	5
My ideal vacation spot would be a remote wilderness area.	1	2	3	4	5
I enjoy digging in the earth and getting dirt on my hands.	1	2	3	4	5
I don't often go out in nature.	1	2	3	4	5
The thought of being deep in the woods, away from civilization, is frightening.	1	2	3	4	5
I am not separate from nature, but a part of nature.	1	2	3	4	5

Continue Survey on Next Page→

6. To what extent do you disagree or agree with the following statements? (Circle one number for each statement that most closely matches your response).

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I always think about how my actions affect the environment.	1	2	3	4	5
My connection to nature and the environment is a part of my spirituality.	1	2	3	4	5
My feelings about nature do not affect how I live my life.	1	2	3	4	5
Animals should have fewer rights than humans.	1	2	3	4	5
The state of non-human species is an indicator of the future for humans.	1	2	3	4	5
I think a lot about the suffering of animals.	1	2	3	4	5

7. Briefly share a memorable time you visited the ocean. For instance, what were you doing? Were you by yourself or with others? Were you on the beach or on a boat? What stood out to you? What were you feeling at the time? (If needed, extra space is provided at the end of the survey).

Continue Survey on Next Page→

8. What is your favorite part of being in the ocean and why? (If needed, extra space is provided at the end of the survey).

9. Have you had dive experience prior to this Open Water Diver course? (Please check one box and, if applicable, fill in the blank).

- I do not have any prior scuba diving experience.
- I have prior scuba diving experience. I have logged approximately _____ dives.

10. What is your age? (Please fill in the blank) _____

11. How do you identify your gender? (Please check one box)

- Woman
- Man
- Other
- Prefer not to share

*Thank you for completing the survey!
Happy diving!*

-----**End of Survey**-----

Extra space for free-responses-----

Extra space for free-responses-----

Scuba Dive Students Making Meaning of the Dive Experience

Important Questions for PADI Open Water Diver Students



Please Complete this Survey and Return to Field Researcher or Dive Instructor.

Participation is Voluntary and Responses are Confidential.

Thank You for Your Cooperation.

A Study Conducted By:



POST-DIVE SURVEY

1. Please provide your first and last initial, the month you were born, and the state in which you are completing your open water certification (OR or HI). (Example: Jane Smith born in April completing her open water certification in Oregon would write: **JSAprilOR**)

First and last initials, month of birth, and state where you will receive certification: _____

2. To what extent do you disagree or agree with the following statements? (Circle one number for each statement that most closely matches your response).

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A lot of my life is centered around recreating in water (lakes, rivers, ocean...).	1	2	3	4	5
I get satisfaction from visiting water areas more than any other type of recreation area.	1	2	3	4	5

I don't understand why others care about marine environment.	1	2	3	4	5
I don't feel a commitment to the marine environment.	1	2	3	4	5

Some species are just meant to die out or become extinct.	1	2	3	4	5
Nothing I do will change problems in other places on the planet.	1	2	3	4	5

3. What is your favorite part of being in the ocean and why? (If needed, extra space is provided at the end of the survey).

Continue Survey on Next Page→

4. What are some reasons why you want to participate in recreational scuba diving? What are some reasons why you think other people want to participate in recreational scuba diving? (Rank the following items for both yourself and what may be the case for others. 1 = most important reason; 6 = least important reason).

Reasons for Diving	Yourself as a Scuba Diver	Scuba Divers in General
Harvesting Food	_____	_____
Adventuring	_____	_____
Becoming a Marine Ambassador	_____	_____
Sight-Seeing/Exploring	_____	_____
Collecting Data as a Citizen Scientist/Researcher	_____	_____
Photography/Videography	_____	_____

5. To what extent do you disagree or agree with the following statements? (Circle one number for each statement that most closely matches your response).

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I enjoy being outdoors, even in unpleasant weather.	1	2	3	4	5
My ideal vacation spot would be a remote wilderness area.	1	2	3	4	5
I enjoy digging in the earth and getting dirt on my hands.	1	2	3	4	5
I don't often go out in nature.	1	2	3	4	5
The thought of being deep in the woods, away from civilization, is frightening.	1	2	3	4	5
I am not separate from nature, but a part of nature.	1	2	3	4	5

Continue Survey on Next Page→

6. To what extent do you disagree or agree with the following statements? (Circle one number for each statement that most closely matches your response).

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I always think about how my actions affect the environment.	1	2	3	4	5
My connection to nature and the environment is a part of my spirituality.	1	2	3	4	5
My feelings about nature do not affect how I live my life.	1	2	3	4	5
Animals should have fewer rights than humans.	1	2	3	4	5
The state of non-human species is an indicator of the future for humans.	1	2	3	4	5
I think a lot about the suffering of animals.	1	2	3	4	5

7. What was most memorable about the open water dive? For instance, what were you doing? Were you by yourself or with others? Were you on the beach or on a boat? What stood out to you? What were you feeling at the time? (If needed, extra space is provided at the end of the survey).

Continue Survey on Next Page→

8. Image that you have a friend who is interested in learning to scuba dive. What would you share with them? Based on your experiences, what can they expect if they choose to learn to dive? (If needed, extra space is provided at the end of the survey).

9. Have you had dive experience prior to this Open Water Diver course? (Please check one box and, if applicable, fill in the blank).

- I do not have any prior scuba diving experience.
- I have prior scuba diving experience. I have logged approximately _____ dives.

10. What is your age? (Please fill in the blank) _____

11. How do you identify your gender? (Please check one box)

- Woman
- Man
- Other
- Prefer not to share

*Thank you for completing the survey!
Happy diving!*

-----**End of Survey**-----

Extra space for free-responses-----

Extra space for free-responses-----

Scuba Dive Students Making Meaning of the Dive Experience

Important Questions for PADI Open Water Diver Students



Please Click the Arrow Below to Complete this Survey.

Participation is Voluntary and Responses are Confidential.

Thank You for Your Cooperation

A Study Conducted By:



3 MONTHS POST-DIVE SURVEY

1. Please provide your first and last initial, the month you were born, and the state in which you are completing your open water certification (OR or HI). (Example: **Jane Smith** born in **April** completing her open water certification in **Oregon** would write: **JSAprilOR**)

First and last initials, month of birth, and state where you will receive certification: _____

2. To what extent do you disagree or agree with the following statements? (Select one number for each statement that most closely matches your response).

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A lot of my life is centered around recreating in water (lakes, rivers, ocean...).	1	2	3	4	5
I get satisfaction from visiting water areas more than any other type of recreation area.	1	2	3	4	5

I don't understand why others care about marine environment.	1	2	3	4	5
I don't feel a commitment to the marine environment.	1	2	3	4	5

Some species are just meant to die out or become extinct.	1	2	3	4	5
Nothing I do will change problems in other places on the planet.	1	2	3	4	5

3. Briefly share a memorable time you visited the ocean. For instance, what were you doing? Were you by yourself or with others? Were you on the beach or on a boat? What happened? What stood out to you? What were you feeling at the time? (If needed, extra space is provided at the end of the survey).

Continue Survey on Next Page→

4. What are some reasons why you want to participate in recreational scuba diving? What are some reasons why you think other people want to participate in recreational scuba diving? (Rank the following items for both yourself and what may be the case for others. 1 = most important reason; 6 = least important reason).

Reasons for Diving	Yourself as a Scuba Diver	Scuba Divers in General
Harvesting Food	_____	_____
Adventuring	_____	_____
Becoming a Marine Ambassador	_____	_____
Sight-Seeing/Exploring	_____	_____
Collecting Data as a Citizen Scientist/Researcher	_____	_____
Photography/Videography	_____	_____

5. To what extent do you disagree or agree with the following statements? (Select one number for each statement that most closely matches your response).

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I enjoy being outdoors, even in unpleasant weather.	1	2	3	4	5
My ideal vacation spot would be a remote wilderness area.	1	2	3	4	5

I enjoy digging in the earth and getting dirt on my hands.	1	2	3	4	5
I don't often go out in nature.	1	2	3	4	5

The thought of being deep in the woods, away from civilization, is frightening.	1	2	3	4	5
I am not separate from nature, but a part of nature.	1	2	3	4	5

Continue Survey on Next Page→

6. To what extent do you disagree or agree with the following statements? (Select one number for each statement that most closely matches your response).

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I always think about how my actions affect the environment.	1	2	3	4	5
My connection to nature and the environment is a part of my spirituality.	1	2	3	4	5

My feelings about nature do not affect how I live my life.	1	2	3	4	5
Animals should have fewer rights than humans.	1	2	3	4	5

The state of non-human species is an indicator of the future for humans.	1	2	3	4	5
	1	2	3	4	5
<u>I think a lot about the suffering of animals.</u>					

7. What was your favorite part of getting scuba certified and why? (If needed, extra space is provided at the end of the survey).

Continue Survey on Next Page→

8. How has your relationship with the ocean changed, if at all, since experiencing scuba diving? (If needed, extra space is provided at the end of the survey).

12. Have you had dive experience prior to this Open Water Diver course? (Please select one and, if applicable, fill in the blank).

- I do not have any prior scuba diving experience.
- I have prior scuba diving experience. I have logged approximately _____ dives.

13. What is your age? (Please fill in the blank) _____

14. How do you identify your gender? (Please select one)

- Woman
- Man
- Other
- Prefer not to share

*Thank you for completing the survey!
Happy diving!*

-----**End of Survey**-----

Appendix E. Cronbach's Alpha Results

Cronbach's alpha results of Marine Attachment Scale and Nature Relatedness Scale Pre, Post 1-Dive and Post 2-Dive based on Cronbach alpha > .60

Indicator	Pre-Dive		Post 1-Dive		Post 2-Dive	
	α	α if item deleted	α	α if item deleted	α	α if item deleted
Marine Attachment	.54		.65		.65	
Life is centered around recreating in water		.39		.52		.49
I get satisfaction from visiting water areas more than any other type of recreation area		.35		.61		.48
I feel a commitment to the marine environment		.43		.50		.47
I understand why others care about marine environment		.63*		.66		.80*
Total NR scale	.78		.81		.82	
I enjoy being outdoors, even in unpleasant weather		.77		.79		.81
My ideal vacation spot would be a remote wilderness area		.76		.80		.80
I enjoy digging in the earth and getting dirt on my hands		.74		.77		.79
I often go out in nature		.77		.78		.81
The thought of being deep in the woods, away from civilization, is not frightening		.77		.80		.82
I am not separate from nature, but a part of nature		.76		.79		.82
I always think about how my actions affect the environment		.76		.78		.75
My connection to nature and the environment is part of my spirituality		.75		.79		.80
My feelings about nature affect how I live my life		.75		.79		.80
I think a lot about the suffering of animals		.77		.80		.80
The state of non-human species is an indicator of the future for humans		.77		.80		.82
Things I do can help problems in other places on the planet		.77		.79		.81
Animals should not have fewer rights than humans		.78		.80		.81
Not all species are just meant to die out or become extinct.		.80*		.83*		.82

*Item deleted

Appendix F. Working Codebook

Working codebook with descriptions of each parent code and each child code.

Category/Code Label	Dive students describe...
Challenging Aspects of Diving	Difficulties or struggles in the dive experience
Challenges	-difficulties or demands of executing scuba dive skill sets in the open water
PNW Conditions	-the underwater conditions in the Pacific Northwest are more rigorous than in the tropics (low visibility, low temperatures, tides, etc)
Emotional Experience	Feelings for or emotional associations with the marine environment/marine life
Amazement and Awe	-experience amazement, joy, awe, euphoria, happiness, or elation when in/around marine environment/life
Calm	-experience care-freeness, calm, liberation, serenity, at peace, humbled when in/around marine environment/life
Excitement and Exhilaration	-experience thrill, exhilaration, excitement when in/around marine environment/life
Scared and Nervous	-experience stress, feeling scared, trauma, anxiety, claustrophobia, fear, nervousness, sadness, daunted, frustrated when in/around marine environment/life
Wonder	-experience feeling curiosity, wonder, surreal, unreal, fascination when in/around marine environment/life
Exposure to Ocean	Experiences they have had in/around marine environment/life
Harvest Activities	- ocean-related experiences involving collecting food including crabbing and fishing
In the Tropics	- ocean-related experiences that take place in a tropical setting
Non-Harvest Activities	-ocean-related activities including surfing, playing, swimming, snorkelling, beachcombing, tide pooling, free diving, boating and more (not including scuba)
Scuba	-scuba diving experience since getting dive certified
Solitary	-ocean-related experiences by oneself or in solitude
Travel, Vacation, Visit	-ocean-related experiences with specific reference to journeying to the beach or ocean and conveys ties to place
With Others	-ocean-related experiences with family, friends, or others
Motivations as Gain	Impetus for learning to scuba dive an opportunity for personal growth, improvement, pleasure or betterment
Leisure Pursuit	-diving as a fun recreational endeavour and as a lifelong goal to be check off the 'bucket list'
Personal Growth	-diving could open up job opportunities, support a lifelong learning, progress existing skills (e.g. from snorkelling to free diving to scuba diving) and/or align with a degree program (e.g. marine biology)
Relationship with Ocean	-scuba diving as means to pursue a relationship with the marine environment; a new kind of relationship or a deepening of existing relationship with the marine environment; desire to gain greater appreciation and/or to be involved with marine environment
Physical Experience	Bodily experience of being in/around marine environment/marine life

Connection to Breath and Body	-experiencing a deeper understanding of/connection with the physical self in/around water
Other Worldly	-the marine environment as outside of the Earthly experience, including properties that might otherwise only be experienced in outer-space: anti-gravity, assisted breathing or alien life
Sensory Input	-physical/sensory-related aspects of the ocean such as feel (tactile), sound, sight, smell
Unpleasant	-negative physical experience with marine environment such as sea sick or cold
Relationship with Marine Life	Types of connections with marine life through experiences or interests
Love of Wildlife	-a general interest in marine life or wildlife
Marine Life for Future Generations	-an interest in being able to see abundant, diverse or healthy marine life in the future for themselves or future generations
Marine Life In Situ	-seeing marine life in its natural habitat; contains elements of humans as visitors to the organism's environment; at times includes more complex descriptions of interactions/functions of marine life
Passive Viewing of ML	-seeing marine life in an impersonal encounter; passively viewing the marine life, instead of actively seeking it; often multiple species in a list or large, generic groupings of organisms ('we saw lots of fish')
Personal Encounter with ML	-a meaningful, intimate, or stand-out encounter with marine life or a specific individual; often some action is taken; seeking, searching, discovering, encountering, pursuing marine life
Relationship I have with Marine Environment	Types of connections with the marine environment
Interest in Marine Ecosystem	-a fascination with or interest in marine environments (which includes abiotic as well as biotic elements); what can the diver learn about or learn from the ocean
Part of Identity	-that the water or ocean is a component of their sense of self; feeling comfortable in the aqueous environment to feeling at home in the water to an intense spiritual connection to the water; a 'two-way' relationship (the ocean is a part of me, I am a part of the ocean)
Protectionist	-a feeling of responsibility towards the ocean or note conservation-related behaviour or inclinations; the diver is the steward and the ocean is the ward
Underwater Frontier	-the ocean or under the water's surface as a new frontier to be explored; the diver is the explorer, the ocean is the frontier
Relationship with Marine Environment Since Diving	Connection to the marine environment that has developed since gaining diving
Relationship Has Changed	-that they believe their connection to the marine environment is not longer the same as it was before diving
Greater Appreciation	-specifically, gaining a greater appreciation for, respect for, understanding of the marine environment since diving
Increased Connection	-gaining, generally, a greater, new, different set of ties to the marine environment since diving
More Responsibility	-gaining of responsibility for marine environment or heightened awareness of marine-related issues

Relationship Has Not Changed	- that they believe their connection to the marine environment is the same as before diving
Rewarding Aspects of Diving	The various ways in which the experience of diving can be gratifying
Bragging Rights	-scuba diving as an activity or skill that can be boasted about; unique set of skills
Camaraderie	-a desire/appreciation for sharing their dive experience with other divers; meeting or connecting with new comrades or discovering the dive community
New World Opens Up	-scuba skills permit them access to new experiences of which they would otherwise be deprived; access to new territory, future adventure or a new relationship with others or the ocean
Perseverance	-overcoming the challenges of diving (physically and emotionally); continuing to dive despite initial struggles
Rewarding Experience	-sights or activities that are not commonly experienced by people; diving as memorable, wonderful, unique, fun or as an activity they would recommend to others
Spiritual Experience	Spiritual experience of being in/around marine environment/marine life
Spiritual Fulfillment	-sense of adventure, freedom, fun when in/around marine environment/marine life
Spiritual Perspective	-sense of looking beyond the self; feeling like a tiny spec in a vast sea, feeling the awe-inspiring power of the ocean in comparison to themselves; feeling like humans don't belong underwater
Technical Aspects of Diving	The various ways in which the experience of diving is practical, procedural or methodical
Gear Costs	-expenses associated with dive equipment or training
Safety First	-the importance of performing best diving practices to promote health and safety
Skill Demonstration	-the mechanics of diving, including the skills tests and technique
