EMPLOYER EXPECTATIONS FOR ENTRY TO THE ENVIRONMENTAL PROFESSION: NECESSARY KNOWLEDGE, SKILLS AND ABILITIES

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CHAPTER I

INTRODUCTION

Statement of the Problem

College degrees offered by institutions of higher learning related to the environment are many and varied. Environmental studies, environmental science, environmental health and safety, environmental safety and health, and even industrial hygiene serve as gateway degrees to the environmental profession. College courses related to the environment that support these degree programs are also many and varied. Faced with such a multitude of choices for degrees and courses, it is imperative that students make good curricular decisions to position themselves for entry-level success in the environmental profession, and that they understand employer expectations related to their knowledge, skills and abilities. This study seeks to determine employer expectations for entry-level environmental professionals regarding necessary knowledge, skills and abilities. It is hoped that this study will align employer expectations with student preparation to position graduates in environmental disciplines for immediate success in the profession.

Research Question

Do employers of entry-level environmental professionals agree on necessary knowledge, skills and abilities for said professionals? The hypothesis of this study is that necessary knowledge, skills and abilities for entry-level environmental professionals can be determined by the Delphi technique utilizing environmental professionals characterized as gatekeepers to the field. Graduates of environmental programs, whether industrial hygienists, environmental scientists, environmental engineers, environmental managers, environmental health and safety professionals, environmental technicians, etc. would benefit by knowing the expectations held by gatekeepers to the field.

Methodology

The diversity of the environmental profession, combined with varied employer expectations from different market sectors, necessitates a study methodology that will accommodate these issues. The methodology chosen for arriving at consensus on necessary attributes of entry-level professionals is the Delphi technique. This study utilizes the Delphi technique to gain expert opinion regarding employer expectations for entry-level knowledge, skills and abilities (KSAs) of graduates seeking employment in the environmental health and safety (EH&S) arena. Research results may serve to further refine the curriculum planning process for institutions of higher learning with degrees in the environmental discipline. Timely, well-considered and designed environmental programs are vital to preparing graduates that are prepared to enter the environmental profession.

Delimitations of the Study

This study will have the following delimitations: the Delphi technique will be utilized to ascertain employer expectations for entry-level hires to the environmental profession; the Delphi panel will consist of 33 (*n*=33) EH&S professionals from three industry sectors; the Delphi panel will be selected by using purposive, stratified, and snowball sampling; the Delphi panel will be surveyed for consensus beginning in August 2010; this study will therefore be delimited to the expert opinions of only those persons selected for inclusion in the panel.

Limitations of the Study

The research may be limited by the following: Delphi panel members will be selected based on hiring authority (gatekeepers), experience in the field, and willingness to participate; Delphi panel members will be selected by the use of purposive, stratified, and snowball techniques; the study will focus on the expert opinion of the Delphi panelists during the study period only, but will be the collective experience of the panelists regarding the environmental profession.

Key Terms and Definitions

Abilities – as defined in the Oxford Desk Dictionary and Thesaurus: American Edition, ability is capacity or power, cleverness, talent, mental power, adeptness, aptitude, facility, knack, skill, gift, faculty, genius or know-how.

Body of knowledge (BOK) – as defined by the American Society of Safety Engineers (ASSE) body of knowledge is a list of knowledge, skills and abilities, organized into an

integrated structure (taxonomy), with a specific level of accomplishment specified for each competency (proficiency). It is the sum of knowledge within a profession that includes proven traditional practices that are widely accepted, innovative emerging practices as well as published and unpublished material. It is a living body of information requiring updating and feeding to remain current.

Competency – as defined by the ASSE, competencies are a list of knowledge, skills, and abilities. Competency is defined in the Oxford Desk Dictionary and Thesaurus: American Edition as ability; being competent; adequately qualified or skilled; fit, capable, suitable, sufficient, satisfactory and acceptable.

Curriculum - as defined in the Oxford Desk Dictionary and Thesaurus: American Edition curriculum is subjects in a course of study.

Delphi technique - according to Strauss and Zeigler (1975) the Delphi technique is a method for the systematic solicitation and aggregation of informed judgments from a group of experts on specific questions or issues. In addition, Linstone and Turoff (1975) characterize the Delphi technique as a method for structuring a communication process so that the process is effective in allowing a group of individuals as a whole, to deal with a complex problem. Thangaratinam and Redman (2005) in their article *The Delphi Technique* define it as a way of obtaining a collective view from individuals about issues where there is no or little definite evidence and where opinion is important. They go on to include the cardinal features of the Delphi technique: use of a number of questionnaire rounds; feedback of responses; the opportunity for participants to modify their responses and the anonymity of responses".

Discipline – as defined in the Oxford Desk Dictionary and Thesaurus: American Edition discipline is a branch of learning.

Environmental science – environmental science is defined in the *Protocol for the Assessment of Learning Outcomes for the Environmental Science Graduate Program* at Oklahoma State University as the sustained improvement of quality of life through wise stewardship of the five systems that lie at the human-nature interface: ecological, social, technological, economic, and governance. Competent stewardship requires interdisciplinary synthesis of the knowledge and skills from several disciplines as well as insights gained from this synthesis. Botkin and Keller (2007) define environmental science as a group of sciences that attempt to explain how life on the Earth is sustained, what leads to environmental problems, and how these problems can be solved.

Gatekeeper - is defined on Dictionary.com as a person in charge of a gate, usually to identify, count, supervise etc., the traffic or flow through it. Gatekeeper as defined by the researcher is meant to be a person or persons that have the authority to hire persons into the environmental profession. For the purposes of this study the term gatekeeper can be used interchangeably with employer.

Knowledge – is defined by the American Society of Safety Engineers (ASSE) as the fact or state of knowing; the perception of fact or truth. As defined in the Oxford Desk Dictionary and Thesaurus: American Edition, knowledge is awareness or familiarity (of a person, fact, or thing); person's range of information; understanding of a subject, language, etc.; sum of what is known.

Skill – as defined in the Oxford Desk Dictionary and Thesaurus: American Edition, skill is expertness; practiced ability; facility in an action; dexterity or tact; talent, aptitude, expertise, mastery; accomplishment, forte, strength.

Profession – as defined in the Oxford Desk Dictionary and Thesaurus: American Edition, a profession is work that involves some branch of advanced learning or science. In addition, it can mean an occupation, calling, field, vocation, employment, specialty, job, position.

CHAPTER II

REVIEW OF LITERATURE

Employment in the Environmental Field

The environmental health and safety field is diverse, multi-faceted and populated by individuals of differing backgrounds, education, experience, certifications and motivations. Employment opportunities in the environmental profession are many and varied. Career paths differ as widely as course options. Recent job guides confirm the many avenues available for persons seeking employment in the field. The environment is not one clear job market, but several different markets in a very large, diverse, segmented industry (Mitchell, 2007). Persons seeking employment in the environmental field may aspire to join the ranks of regulatory agencies at the federal, state or local levels and pursue opportunities with the Environmental Protection Agency (EPA), state departments of health and environmental protection, or municipalities in support of water quality, land protection and occupational safety and health. Others may pursue opportunities with private companies and attempt to join the ranks of employers performing environmental work in energy companies, consulting companies, manufacturing facilities, construction companies, and others. Still other career-seeking individuals may pursue opportunities with environmental non-profit organizations including the Nature Conservancy,

Greenpeace and the Sierra Club. Information obtained from the US Department of Labor's website (www.dol.gov) details an encouraging employment picture for environmental scientists with an expected increase of 25% between the years of 2006 and 2016 which is characterized as much faster than average by the Department of Labor's *Key Phrases in the Occupational Outlook Handbook 2008-2009 Edition.* Employment growth characterized as much faster than average is defined as anticipated employment increase (growth) of 21% or more (www.dol.gov).

Academic Programs about the Environment: History/ Nature/ Curriculum

University level degree programs featuring studies about the environment have been in existence since the 1960s, and increased in popularity and student enrollment with the beginning of what is known as the environmental decade (1970s). Romero and Silveri (2006) indicate that the first environmental academic program was established in 1900, with only 14 more programs by 1958. Rapid growth, however, took place shortly after the close of the 1950s. In fact, the earliest academic program may have been established at Williams College about 1968 (Hornig, 1996), but others followed quickly. Focht (2005) states that "the oldest environmental science program is probably about one hundred years old, then goes on to reiterate that most of them (environmental programs) are since 1970, so let's say thirty or thirty-five years old" (2005).

Environmental studies became prominent at the college and university level following the surge in public concern over environmental issues that arose in the 1970s (Schoenfeld & Disinger, 1978), and boomed in the 1970s (Sherren, 2008) when environmental impact statements became legislated, environmental agencies were

established, and employment increased accordingly. Much of the interest in academic programs mirrors the rise of the environmental movement, which can be traced most directly to the publication of Rachel Carson's landmark book *Silent Spring* published in 1962. However, recognition of the need for and importance of protection of the environment manifested much earlier with roots in the preservation and conservation movements of the late nineteenth and early twentieth centuries. Romero and Silveri (2006) indicate that their survey(s) showed that representatives of the programs surveyed cited students and faculty demand and job market opportunities as the most common reasons behind the creation of these programs.

According to Focht (2005) "we are somewhere between 600 and 1,100 programs (environmental) nationally". Romero and Jones said "there was something like 1,065 environmental programs in the United States". An internet search (Bednarz, 2006) using EnviroEducation.com lists 487 environmental studies programs at colleges and universities in the United States and 744 in environmental science. Romero and Silveri (2006) have been studying environmental programs and departments in U.S. Academic Institutions since 2004 and consistently number the programs at greater than 1,000.

"Since its rapid entrance into higher education in the 1960s and 1970s, environmental education has continued to gain footing in universities across the USA, rooting itself in interdisciplinary environmental studies programs as well as more traditional academic disciplines such as geography" (Hayes-Conroy, Vanderbeck, 2005). According to Stapp *et al.* (1969), environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to solve these problems, and motivated to work

towards their solution. For professional environmental education, environmental protection studies, which are interdisciplinary, demand particular attention. They equip graduates with knowledge about the natural environment and how to protect it. They include problems from chemistry, biology and geography, and also elements of physics, mathematics, computer science, economics, law, medicine, chemical engineering, urban planning and architecture, and sometimes humanities and philosophy (Tarabula-Fiertak; Gajus-Lankamer; Wojcik, 2004). Much of Focht's work with the Council of Environmental Deans and Directors (CEDD) has involved a curriculum committee multi-year study that details the interdisciplinary nature of environmental studies and programs. Focht and Vincent (2008) detail academic programs across the United States that concentrate on environmental studies and environmental science with coursework in social science, humanities, education, social research, community relations, advocacy and outreach, and creative and journalistic writing. Programs that tilt to natural resources are similar in nature but place a higher importance on engineering and the built environment, decision science, information management, and personnel management. Finally programs that emphasize policy, planning and administration place less importance on the natural sciences, but a higher importance on social sciences, creativity, problem-solving, social research, and community relations (Focht & Vincent, 2008). Focht's presentation at Pace University in 2005 detailed *Overcoming Disciplinary Boundaries in Environmental Curricula* and detailed the "multidisciplinary, interdisciplinary, transdisciplinary and perhaps even metadisciplinary nature of environmental studies curriculum" (Focht, 2005). Hornig (1996) may have summed up the challenges presented to curriculum and program developers, environmental studies students, and

employers when he stated that "an undergraduate environmental studies curriculum needs to prepare students for jobs that haven't been invented yet".

The Delphi Technique – Historical Aspects

"In spite of its conjuring images – soothsayers, Greek gods, and the like – the Delphi technique is a rather simple and straightforward technological innovation. Named by its RAND Corporation innovators after the greatest of all Greek oracles, Apollo's Delphic Oracle, the Delphi technique is a method for the systematic solicitation and aggregation of informed judgments from a group of experts on specific questions or issues" (Strauss and Zeigler, 1975). The derivation of the term Delphi relates to the Delphi Oracle, an ancient Greek myth which held that a chosen one on the island of Delphi was able to predict the future with infallible authority. Delphi was originally used to forecast technological developments; thus, like the oracle, it was used to look into the future (Clayton, 1997).

The Delphi method has its origins in the American business community, and has since been widely accepted throughout the world in many industry sectors including health care, defense, business, education, information technology, transportation and engineering (Hartman, Krahn, Skulmoski (2007). It is generally accepted that the Delphi technique is attributable to efforts of the RAND Corporation beginning in the early 1950s. This research was initially in support of defense activities, and had its roots in the Cold War era of that time. According to Linstone and Turoff (1975), the Delphi concept may be viewed as one of the spinoffs of defense research. Project Delphi was the name given to an Air Force-sponsored RAND Corporation study, starting in the early 1950's,

concerning the use of expert opinion. The objective of the original study was to obtain the most reliable consensus of opinion of a group of experts…by a series of intensive questionnaires interspersed with controlled opinion feedback.

The original Delphi method was developed by Norman Dalkey of the RAND Corporation in the 1950's for a U.S. sponsored military project. Dalkey states that the goal of the project was "to solicit expert opinion to the selection, from the point of view of a Soviet strategic planner, of an optimal U.S. industrial target system and to the estimation of the number of A-bombs required to reduce the munitions output by a prescribed amount" (Dalkey & Helmer, 1963). In clinical education, the Delphi technique has been used in a variety of ways including forecasting, planning and curriculum development (Thangaratinam & Redman 2005) and is regarded as a reasonable strategy for achieving consensus over curricular needs.

Whether the Delphi technique is utilized for defense planning purposes, for curriculum development at the post-secondary levels, or to help answer a plethora of questions somewhere in-between, it is a particularly good research method for deriving consensus among a group of individuals having expertise on a particular topic where information sought is subjective and where participants are separated by physical distance (Borg & Gall, 1979; Dalkey & Helmer, 1962-63; Linstone & Turoff, 1975). Put more succinctly, when the goal is to identify knowledge through the consensus of experts, the Delphi technique has already been established in the literature as a useful empirical method across diverse disciplines (Addison, 2003; Brill et al., 2000; Cochran, 1983; Linstone & Turoff, 1975; Smith, 1997; Thach & Murphy, 1995; Whitman, 1990).

Characteristics of the Delphi Technique

The literature available on the Delphi technique is comprehensive and covers its use in a variety of fields, questions, and applications. There are hallmarks of the Delphi technique that are apparent in the literature and unique to Delphi. In general, the Delphi technique seeks to obtain consensus from a panel of experts on a given topic, question or problem. Consensus is generated through a series of iterative exercises that allow for initial brainstorming on a generally open-ended research question, followed by analysis (usually statistical) and re-consideration, further analysis and finally halting activity when consensus or gridlock has been reached. The information that follows is designed to give the reader examples from the literature that describe the characteristics of the Delphi technique including the initial question importance, use of experts as panelists, the number of panelists, the importance of the group dynamic in the process, the subjective nature of the Delphi technique, the importance of anonymity, iteration, building consensus, the Delphi technique as utilized in the curriculum process, the traits of a typical Delphi process, advantages and limitations, and rigor.

Initial Question

There is much literature available that discusses the importance of utilizing the correct initial question to develop ideas, interest and continuity from the panel for the remainder of the study. Put simply, the clear and concise initial question should be designed and thought out to stimulate ideas, discussion and input from the panel of experts. The literature reviewed by this author highlighted the importance of an initial question that was sufficiently broad to stimulate idea development and brainstorming.

Put more succinctly, there is a continuum representing the degree of focus or openness of the questionnaire questions. For example, the initial questions are typically broad, open-ended questions so as to widely cast the research net (Adler & Ziglio, 1996); Delbecq et al., 1975; Linstone & Turoff, 1975). Wright (2004) confirms this line of reasoning when he indicated that the Delphi technique attempts to not predetermine, elicit or restrict specific answers from panelists, or restrict certain responses. The first question posed to the panelists, therefore, is open-ended and general in nature. A very pragmatic reason for the more broad-based question is highlighted by Skulmoski, Hartman, & Krahn (2007), that also details an important consideration regarding analytical time; "the tradeoff, however, is that more data is likely to be collected with broad, open-ended questions requiring more time consuming analysis. Focused or broad questions, is a significant decision that needs to be made early in the research design phase". A typical open-ended initial question is detailed in Hammersley and Tynon's 1998 study; "what are the most important job tasks or competencies performed by entry-level resort and commercial recreation professionals?"

The importance of deciding on the initial interview question for the Delphi technique quite early in the research process cannot be overstated. The researcher must select a question that is broad enough to stimulate discussion and inputs from a wide variety of experts, but narrow enough in focus so that manageability does not suffer. The decision regarding the initial question is one that should guide the panel of experts in the direction to most efficiently answer the overarching goal of the research project.

Use and Selection of Expert(s)

A very important consideration for the researcher is to decide how, and as importantly who is selected to serve on the Delphi panel. In the following section this researcher will highlight literature that details important considerations for panel selection, and indeed the importance of experts in general. For a researcher to answer the question of what body of knowledge, or core competencies, or KSAs an entry-level environmental professional must possess to make it past the gatekeepers to the environmental profession, the researcher must first select persons that are able, willing and most importantly well-versed in the topic under consideration to provide input. The literature reveals that the selection of the expert panel for the Delphi technique is an important step for the researcher to consider. In other words, the researcher must "get it right" when selecting the panel of experts if they are to provide valuable insight. Following are examples from the literature that detail the importance and correctness of utilizing experts for the Delphi panel: Delphi is of significant use in resolving situations where no definite evidence is available, by relying on the knowledge and experience of experts (Thangaratinam & Redman, 2005); According to Dalkey (1972) the Delphi is a procedure that is a rapid and efficient method to "cream the heads" of a group of knowledgeable people; The Delphi technique is a group process used to survey and collect the opinions of experts on a particular subject (Yousuf, 2006); Particular areas of concern when conducting a Delphi study include developing the initial questions and selecting the expert panel (Brill, Bishop & Walker, 2006); The decision to use the Delphi technique should be based on the purpose or objective of a research study which wishes "to obtain the most reliable consensus of opinion of a group of experts" (Dalkey &

Helmer, 1963). If the objective is the identification of content based on expert consensus, then the Delphi technique is an appropriate choice as it may enhance the significant contributions of the panel. The Delphi technique, by definition, is a group process involving an interaction between the researcher and a group of identified experts on a specified topic, usually through a series of questionnaires (Yousuf, 2006). The Delphi technique has application whenever policies or ideas have to be based on informed judgment. This technique is useful when opinions and judgments of experts and practitioner are needed but time, distance and other factors make it unlikely or impossible for the panel to work together in one physical location (Yousuf, 2006).

The Cornell University Website – Agricultural Education Assessment Project, states that "the Delphi technique is a widely used method of securing consensus from experts in a given area of study. Using Delphi, the researcher identifies a panel of experts, solicits from that panel an unranked list of answers to a specific question, and finally has the experts rate the items in terms of importance or some other criterion. The result is usually an ordered list of items that are agreed upon by the experts as being the answers to the question or the solution to the problem (Stitt-Gohdes & Crews, 2004). The majority relied upon homogenous samples. These were purposive samples developed with the snowball technique, which is also known as chain sampling and is used to help the researcher find out who has the information that is important to the study. The researcher starts with key informants who are viewed as knowledgeable about the program or community. The researcher asks the key informants to recommend other people to whom he or she should talk based on their knowledge of who should know a lot about the program in question. Although the researcher starts with a relatively short list

of informants, the list grows (like a snowball) as names are added through the referral of informants (Mertens, 1998). Patton (2002) recommends creating criteria for including respondents. Powell (2003) contends that the panel of experts should include individuals that reflect current knowledge, have recognition and credibility based on their knowledge of the topic, and represent diverse perspectives to include a wide range of viewpoints.

In Hammersley and Tynon's (1998) study of job competency of entry-level resort and commercial recreation professionals, the selected panel of experts qualified for the study by holding a professional membership in RCRA, currently working in a resort or commercial recreation setting that provides direct services to guests, and having held that position for at least five years, or working in a resort or commercial recreation setting providing management services for at least the past five years.

The Delphi method requires that a panel of experts on the subject under study be selected (Clayton, 1997). Expertise, however, is the desired goal for panel selection and it is this feature which sets Delphi apart from other general forms of survey research (Clayton, 1997). Because Delphi is a tool to aid understanding or decision-making, it will only be an effective process if those decision-makers who will ultimately act upon the results of the Delphi are actively involved throughout the process (Clayton, 1997). The critical issue in all of this is to identify the 'expert' qualifications of panel members (Clayton, 1997). Once the general characteristics of the desired panelists are agreed upon, the Delphi director needs to initiate a nomination process. Nominations of well known and respected individuals from members within selected target groups should be solicited and, through a process or ranking and culling, highly ranked nominees become evident and form the basis for panel selection. The Delphi participants should meet four

"expertise" requirements: 1) knowledge and experience with the issues under investigation; 2) capacity and willingness to participate; 3) sufficient time to participate in the Delphi; and, 4) effective communication skills (Adler & Ziglio, 1996). An expert is someone who possesses the knowledge and experience necessary to participate in a Delphi (Clayton, 1997). Some would argue that an expert is "any individual with relevant knowledge and experience of a particular topic" (Thangaratinam & Redman, 2005). Choosing a qualified expert panel in a Delphi study requires carefully matching the expertise of the individual with the topic under study (Delbecq, Van de Ven, & Gustafson, 1975). Mismatches lead to outlier responses that decrease the Delphi study's validity and threaten consensus building.

Content analysis of the literature reveals that a panel of experts is justified and very important for the Delphi technique. Various definitions abound of what constitutes an expert, but for the purposes of this study the researcher will utilize the following characteristics of an expert for inclusion in the panel: hiring authority for opportunities in the EH&S profession; a minimum of seven years experience in the EH&S profession; willingness to serve as an expert on the Delphi panel; and to borrow from Clayton (1997) "any individual with relevant knowledge and experience of a particular topic", with this topic being the practicing arena of the environmental professional. In fact, the topic under consideration for this study is employer expectations for KSAs, or core competencies, or body of knowledge for entry-level environmental professionals.

Number of Participants

The literature is consistent regarding the number of experts necessary for a Delphi panel. Studies were reviewed that utilized Delphi panels in the thousands, and additional research revealed that Delphi panels that function well need not be overly large to arrive at consensus; even regarding difficult topics. Following are some selections from the literature that highlight various researcher's considerations when dealing with the issue of panel size: Finally, the sample size varies in their studies from four to 171 "experts" (Krahn, Hartman and Skulmoski (2007); Mullen cites Reid's acknowledgement (1988) that large panels tend to have high attrition rates and that groups of 20 often retain their expert panelists; Delbecq et al., (1975) states that the optimum size for a Delphi group should not exceed 30; A practical consideration facing the researcher is the sample size. A number of factors should be considered: Heterogeneous or homogeneous sample – where the group is homogeneous, then a smaller sample of between ten to fifteen people may yield sufficient results. However, if disparate groups are involved (e.g. an international study), then a larger sample will likely be required and several hundred people might participate (Delbecq et al., 1975). Heterogeneous groups can greatly increase the complexity and difficulty of collecting data, reaching consensus, conducting analysis, and verifying results; Decision quality/Delphi manageability tradeoff – there is a reduction in group error (or an increase in decision quality) as sample size increases. However, above a certain threshold, managing the Delphi process and analyzing the data becomes cumbersome in return for marginal benefits; Internal or external verification – the larger the group, the more convincingly the results can be said to be verified. However, a smaller sample might be used, with results verification conducted with

follow-up research (Skulmoski, Hartman, & Krahn); Potential sample size is positively related to the number of experts (Skulmoski, Hartman, & Krahn, 2007); Depending on the purpose of the study, the complexity and the expertise required, the panel may be large or small and local, state, national, or international. Group size theory varies, but some general rules-of-thumb indicate 15-30 people for a homogeneous population—that is, experts coming from the same discipline and 5-10 people for a heterogeneous population, people with expertise on a particular topic but coming from different social/professional stratifications such as teacher, university academics and school principals (Delbecq et al.,1975; Uhl, 1983; Moore, 1987). There are no hard and fast rules. Linstone suggests that "a suitable minimum panel size is seven" (Thangaratinam & Redman, 2005); Representation is assessed by the qualities of the expert panel rather than its numbers (Thangaratinam & Redman, 2005).

Group Communication Process

Another hallmark of the Delphi technique is the necessity of utilizing a group for the research. Delphi is essentially a group communication process made necessary by time, distance or other constraints. Linstone and Turoff (need to find year and publication) state that "Delphi may be characterized as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem". Linstone and Turoff (1975) state the group process as follows: "Delphi may be characterized as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem, and that those who seek to utilize Delphi

usually recognize a need to structure a group communication process in order to obtain a useful result for their objective". In short, this aspect of Delphi may be summed up as several heads are better than one.

Subjectivity

In reviewing the literature available regarding Delphi, it is apparent that one of the strengths of this technique is the ability to capture the richness inherent when persons bring their biases, experience, history and opinions regarding the topic. This allows the researcher to capture the richness, subjectivity and qualitative nature of the data. Prior researchers cite the importance of capturing opinion from the panel experts. The Delphi technique is a way of obtaining a collective view from individuals about issues where there is no or little definite evidence and where opinion is important (Thangaratinam & Redman, 2005). Skutsch and Hall (1973) identified the Delphi technique as a method for judgments on complex matters where precise information is unavailable. While the Delphi is typically used as a quantitative technique (Rowe & Wright, 1999), a researcher can use qualitative techniques with the Delphi method. Qualitative research is interpretive in the sense that the researcher is interested in how the social world is understood and experienced; the researcher is flexible and sensitive to the social context within which the data was collected; and qualitative research is about producing holistic understandings of rich, contextual and detailed data (Mason, 1996). Linstone and Turoff (1975) further stated that one or more of the following leads one to use the Delphi technique: The problem does not lend itself to precise analytical techniques but can benefit from subjective judgments on a collective basis, and that "for, if anything is true

about Delphi today, it is that in its design and use Delphi is more of an art than a science". In summation regarding subjectivity, the literature is clear that the Delphi panelist's bring subjectivity to their input, even though much of the analysis involves objective analysis, generally through descriptive statistical methods.

Anonymity

Another hallmark of the Delphi technique is the necessity of the panel of experts remaining unknown to each other. The literature is clear when highlighting the need for only the researcher to know the identities of the panelists. The Delphi technique is also a prescribed methodology for cases when participants hail from different professions, because anonymity provides a layer of protection for individual voices (Melpignano & Collins, 2003). It is the intent of this researcher to utilize the worldwide web for facilitation of much of the research, and this appears to mesh with Linstone & Turoff (1975) who indicate that the www not only serves as an efficient means for survey research, but also readily supports intent of the Delphi technique for the anonymous interaction of respondents. Rowe and Wright (1999) characterize the classical Delphi method by four key features: anonymity of Delphi participants, which allows the participants to freely express their opinions without undue social pressures to conform from others in the group. Decisions are evaluated on their merit, rather than who has proposed the idea. As recommended by McKenna (1994), and to protect all participants, the opinions and specific ratings of an individual remain anonymous to other panel members. Finally, the advantage of anonymity is that it is a leveler of opinion, removing the effects of status, personalities and group pressures that can arise in meetings

(Thangaratinam & Redman, 2005). It is clear that anonymity of panelists is a hallmark of a properly designed Delphi study.

Iteration

The Delphi method tries to obtain the most reliable consensus of opinion of a group through a series of intensive questionnaires interspersed with controlled feedback. The technique involves repeated questioning of the individuals and avoids direct confrontation of group members with each other (Clayton, 1997). Dalkey (1967) defines the Delphi technique as essentially an iterative series of questionnaires, with each subsequent questionnaire containing information gathered from those preceding it. The process ends when consensus is reached or sufficient information has been exchanged. While a three round Delphi is typical, single and double round Delphi studies have also been completed (Krahn, Hartman and Skulmoski (2007). Therefore, it is crucial that future researchers have enough rounds to allow experts to come to consensus, but not so many that they are lost to attrition (Cowan, 2009). Many first round questionnaires involve open-ended questions that ask for expert opinion and brainstorming from the panel members (Cowan, 2009). The Delphi method requires a minimum of two rounds (three if round one is open-ended). Beyond that, the number of rounds is disputed. Most studies use only two or three rounds (Thangaratinam & Redman, 2005). The data collection processes for these student projects again are conventional. The number of rounds again is variable and dependent upon the purpose of the research. Delbecq, Van de Ven and Gustafson (1975) suggest that a two or three iteration Delphi is sufficient for most research. If group consensus is desirable and the sample is heterogeneous, then

three or more rounds may be required. However, if the goal is to understand nuances (a goal in qualitative research) and the sample is homogeneous, then fewer than three rounds may be sufficient to reach consensus, theoretical saturation, or uncover sufficient information (Skulmoski, Hartman, & Krahn). Finally, as the number of rounds increases and the effort required by Delphi participants, one often sees a decline in the response rate (Alexander, 2004; Rosenbaum, 1985; Thomson, 1985; Rowe and Wright (1999) discuss the need for iteration, which allows the participants to refine their views in light of the progress of the group's work from round to round. The Delphi method is an iterative process used to collect and distill the judgments of experts using a series of questionnaires interspersed with feedback (Hartman, Krahn, Skulmoski (2007). According to Linstone and Turoff (1975), there are three types of Delphi: conventional; real-time; and policy. In conventional Delphi, a team designs a questionnaire which is sent to a larger respondent group. After the questionnaire is returned, the monitor team summarizes the results and, based upon the results, develops a new questionnaire for the respondent group. Delphi study procedures call for the collection of data from identified experts in response to an open-ended initial question based on a particular subject area. Those data are then analyzed for themes, compiled, and fed back to the panel of experts through a second round in questionnaire form for additional ratings or rankings. This process is repeated until consensus—general statistical agreement among the data—is achieved (Linstone & Turoff, 1975). The cardinal features of the Delphi method are the use of a number of questionnaire rounds, feedback of responses, the opportunity for participants to modify their responses and anonymity of responses (Thangaratinam & Redman, 2005). The technique relies on a series of sequential rounds of questionnaires,

which should lead to consensus among the panel of experts (Delbecq et al. 1975; Linstone and Turoff 1975; Powell 2003; Rowe and Wright 1999; Sharkey 2001). Therefore, whether a Delphi approach is classic, policy based, or any other number of modified versions, most authors agree that the process of group brainstorming and the follow-up of quantitative and qualitative feedback concerning a complex issue or problem hold true to the model (and original intent) of the Delphi technique (Cowan, 2009 unpublished dissertation).

In summary, iteration is clearly one of the most important aspects of the Delphi technique. This gives the panelists an opportunity to reflect, refine, and revisit their answer, choices and opinions based on analysis of the group's efforts.

Gaining Consensus

Consensus is a goal of the classic Delphi. Although methods including the Policy Delphi seek to engender varying opinions, the classic Delphi seeks to arrive at consensus on a particular question or problem. The Delphi technique is a particularly good research method for deriving consensus among a group of individuals having expertise on a particular topic where information sought is subjective and where participants are separated by physical distance (Brill, Bishop, & Walker, 2006). Consensus was not defined *a priori*, but rather emerged from the data (Williams and Webb 1994). Hence, we compared levels of consensus from Rounds Two and Three.

According to Turoff (1970), there are four possible objectives or secondary goals, for any Delphic exercise, namely: 1) to explore or expose underlying assumptions or information leading to differing judgments; 2) to seek out information which may

generate a consensus of judgment on the part of the respondent group; 3) to correlate informed judgments on a topic spanning a wide range of disciplines; and 4) to educate the respondent group as to the diverse and interrelated aspects of the topic. Building consensus is an essential component of any policy-making process. The hallmarks of the policy Delphi method are to bring together stakeholders with opposing views and to systematically attempt to facilitate consensus as well as to identify divergence of opinion (Strauss & Zeigler, 1975).

Typical Delphi Process

Linstone and Turoff (1975) indicate that usually Delphi, whether it is conventional or real-time, undergoes four distinct phases. The first phase is characterized by exploration of the subject under discussion. The second phase involves the process of reaching an understanding of how the group views the issue. If there is significant disagreement, then that disagreement is explored in the third phase to bring out the underlying reasons for the differences and possibly to evaluate them. The last phase, a final evaluation, occurs when all previously gathered information has been initially analyzed and the evaluations have been fed back for consideration. Krahn, Hartman and Skulmoski (2007) the Delphi process has been comprehensively reviewed elsewhere, so they present only a brief overview of how they have utilized the Delphi process in their graduate student's research projects. This overview includes the following for a three round Delphi process: 1) Development of the Research Question; 2) Design of the Research; 3) Research Sample; 4) Development of Delphi round one questionnaire; 5) Delphi Pilot Study; 6) Release and analyze round one questionnaire; 7) Develop round

two questionnaire; 8) Release and analyze round two questionnaire; 9) Develop round three questionnaire; 10) Release and analyze round three questionnaire, and ; 11) Verify, generalize and document research results.

In considering the design considerations, Krahn, Hartman and Skulmoski (2007) state that "while the Delphi method is flexible and superficially simple, the researcher needs to take into account many design considerations in order to successfully use the method. Poorly applied like any other research method, the Delphi can yield suspect results. Having used and modified the Delphi method in many research projects in our program, we present some of our insights into Delphi method considerations". While some researchers include their Delphi instrument with their publication (Brancheau et al., 1996; Niederman et al., 1991), most do not. In order to tell good numbers from bad numbers, we need to understand not only what was learned, but also how the researchers collected their data. We need to see the instrument and key data (Glass, 1997; Sawyer, 1997). Loo (2002) notes "four key planning and executive activities for a Delphi". These include problem definition, panel selection, determining the panel size, and conducting the Delphi rounds. Dalkey (1967) has identified the following basic characteristics of the Delphi technique: anonymity; controlled feedback from the interaction; and statistical group response.

The Delphi technique is similar in nature to the Nominal Group Technique (NGT), but has characteristics not found in either NGT or the Interacting Group Method (IGM). Firstly, idea generation by individuals is not only individual and independent, but also isolated and anonymous. Secondly, communication between individuals is orchestrated by a director and occurs via written questionnaires and feedback reports.

Group decision-making exercises also pose a variety of logistic concerns such as the ability to bring together a large group of people often required for both NGT and IGM methods (Clayton, 1997).

Regardless of the type of Delphi used, some characteristics are common to all Delphi techniques: iteration – the judgments of individuals are aggregated and communicated back to all participating experts in a series of questionnaires; controlled feedback – the communication of aggregated judgments occurs in the form of summary measures of responses to questionnaires; and statistical group response – the summaries of individual responses are presented in the form of measure of central tendency, dispersion and frequency of distributions (Dunn, 1981). Stated more concisely by Strauss and Zeigler (1975) regardless of objective or goal, all Delphi designs hold a number of characteristics in common: all Delphi designs use panels of experts for obtaining information or data (Delphi designs are founded on the old premise that two heads are better than one); All Delphi designs are conducted in writing; All Delphi designs systematically attempt to produce a consensus of opinion, as well as – and sometimes more importantly – identify opinion divergence; All Delphi designs guarantee the anonymity of both the experts and identification of the expert's statements throughout the exercise; In extended use of the technique, Delphi designs use iteration and controlled feedback to converge on consensus or divergence. Participants are permitted to review and revise their statement after reading the statement of their peers, as well as evaluate all statements, reducing intentional and unintentional "noise" within the exercise, i.e., irrelevant, nonproductive and potentially frustrating communication; extended Delphi designs are conducted in a series of rounds between which a summary of the results of

the previous round is communicated to and evaluated by the participants. The second and successive rounds often produce a "narrowing of the initial spread of opinions and shifting of the median…If no consensus emerges, at least a crystallizing of the disparate positions usually becomes apparent" (Gordon, 1971).

As Enzer et al. (1971) observe, Delphi designs are usually better than other methods for eliciting and processing judgmental data, since they maintain attention directly on the issue and provide a framework within which individuals with diverse backgrounds or in remote locations can work together on the same problems and produce precise documented records.

Advantages of the Delphi Technique

The literature reviewed indicates several hallmark advantages of the Delphi technique for arriving at consensus on a question or problem. Skulmoski, Hartman, & Krahn (2007) state that "the Delphi method is well-suited to rigorously capture qualitative data." It may be seen as a structured process within which one uses qualitative, quantitative or mixed research methods. Such flexibility not only affords the ability of the method to answer many research questions, but also can be well matched to the abilities and aptitudes of the graduate student. In addition, mirroring the advantage of anonymity discussed earlier, Wright (2004) states that the most significant problem associated with face-to-face contact is the influence of group dynamics on individual responses (Wright, 2004). According to several authors (McKenna 1994; Powell 2003), the strengths of the Delphi include the following: achieve consensus on topic of uncertainty or little empirical evidence; widen knowledge through multiple rounds;

stimulate new ideas among the panel members; and encourage decision-making. When the goal is to identify knowledge through the consensus of experts, the Delphi technique has already been established in the literature as a useful empirical method across diverse disciplines (Addison, 2003; Brill et al., 2000; Cochran, 1983; Linstone & Turoff, 1975; Smith, 1997; Thach & Murphy, 1995; Whitman, 1990). Larson & Wissman (2000) selected the Delphi method for their study because it can be used to gain consensus where geography limits the practicality of face-to-face discussions and when anonymity is desired (Larson & Wissman, 2000). Yousuf (2006) lists several strengths of the Delphi technique, and indicates that it is particularly useful when the problem does not lend itself to precise analytical techniques but can benefit from subjective judgments on a collective basis. In addition he states additional advantages including being simple to use, preventing groupthink, and the flexibility. The conventional Delphi procedure offers decision-makers a user-friendly, rigorous and systematic strategy in the collection and dissemination of critical information (Clayton, 1997). Moore (1987) provides four reasons why using a group of people rather than an individual is more desirable in conducting applied social research: 1) it is logical that if you properly combine the judgment of a large number of people, you have a better chance of getting closer to the truth; 2) it is desirable to use groups in order to understand social phenomena by obtaining the views of the actors; 3) it is often beneficial to use groups if you are concerned about the consequences of your research. If your goal is to solve a problem of a particular group, it is reasonable to believe that the group is more likely to accept your advice (or research findings) if they have participated in the research process; and 4) complex, ill-defined problems often can be addressed only by pooled intelligence. Even

in the face of limitations, and researchers are cautioned to take into account these limitations when considering the results of Delphi studies, the Delphi has great strength and utility. It collects and organizes judgments in a systematic fashion. It gains input, establishes priorities and builds consensus. It organizes and helps to focus dissent, turning this group effect into a window of opportunity. In short, Delphi cannot be overlooked as a useful and potent tool when attempting to harness expert opinion for critical decision-making tasks in education (Clayton, 1997). According to Clayton (1997) when consensus is achieved by refinement through discussion and feedback rather than through alignment by acquiescence, authenticity of consensus is far more valid. The Delphi technique is regarded as a reasonable strategy for achieving consensus over curricular needs. A clear consensus about what constitutes good practice is essential to establish competences for curriculum development. This often requires detailed consideration of a variety of differing views and opinions. The Delphi technique has usefully provided a means for constructively addressing these issues. The Delphi has been used to identify competencies needed for a variety of healthcare professionals including pharmacists, nurses and colposcopists (Thangaratinam & Redman, 2005). Stated concisely by Strauss & Zeigler (1975) the Delphi technique and its variants are still in the developmental and refinement stage. One of Delphi's greatest virtues lies in its simplicity: advanced mathematical skills are not necessary for design, implementation, and analysis of a Delphi project. A current need is that of a creative project designer who is aware of the problems of Delphi technology as it stands today.

Limitations of the Delphi Technique

There are limitations to the Delphi technique that should be pointed out. As Enzer et al. (1971) observe: Delphi studies are usually slow and time-consuming; It may lack the stimulation provided by face-to-face encounters; The intermediary (or the respondents themselves) may misunderstand the brief written inputs of the panel members; The technique's theoretical foundations may be misunderstood by the participants; and the panel of experts could be too homogeneous or like-minded, thus producing a skewed data set (Strauss & Zeigler, 1975). In addition, Williams and Webb (1994) found that the time requirement and commitment needed from panel members led to members dropping out and losing interest. Gupta and Clarke 1996; Powell 2003; Williams and Webb 1994 contend that there is a lack of accountability and panel members may make rushed decisions due to the anonymity. McKenna (1994) contends that the exclusion of non-expert knowledge can result in the loss of valuable ideas and insights. Finally, low response rates in the final rounds have been a major limitation of the technique in some studies.

Importance of Methodological Rigor

While there are many varieties of Delphi, common to all are design considerations that need to be decided upon including sample composition, sample size, methodological orientation (qualitative and/or quantitative), the number of rounds, and mode of interaction. Considering these choices help to add rigor to the method. Increased rigor contributes to a successful Delphi and deeper understanding of the information systems (IS) discipline (Skulmoski, Hartman, & Krahn, 2007). In other words, the greater the

departure from classical Delphi, the more likely it is that the researcher will want to validate the results, by triangulation, with another research application (Skulmoski, Hartman & Krahn, 2007). As Clayton (1997) states, the importance of maintaining close contact with participants in a study of this nature cannot be stressed too highly, and the high response rates achieved by Delphi studies are likely to have resulted from maintaining close, cordial and frequent contact.

In summary of the characteristics inherent in the Delphi technique, the literature is consistent regarding the need for a broad-based initial question, thoughtful selection of the panel of experts, the number of expert panelists selected, the importance of the group process to the overall success of the study, the subjectivity inherent in the Delphi technique, the importance of anonymity, the iteration involved, obtaining consensus, the stages inherent in a typical Delphi study, the advantages of Delphi, the limitations to Delphi, and the importance of methodological rigor.

CHAPTER III

METHODOLOGY

Research Purpose

The purpose of this study is to answer the question: do employers in the environmental profession agree on a definable list of KSAs for persons seeking entry-level employment in the field? It is the hope of this researcher that the study will serve to increase cohesion and continuity concerning expectations between and among students, curriculum committees, employers, job-seekers, program-coordinators, graduates, university employment services placement officers, professors, and other stakeholders. The better prepared a student is to enter the environmental profession from the view of an employer to that profession, the greater the chance for immediate and lasting success. This study will hopefully aid decision-makers in interdisciplinary environmental (IE) degree programs to consider the needs of employers when designing curriculum, courses, programs, and degrees.

Preliminary Procedures and Panel Selection

Gatekeepers to the environmental profession for the purposes of this study were defined as persons who worked in the environmental profession and who possessed either directly or in a preliminary fashion hiring authority into the field. It was decided that a panel of 33 gatekeepers would comprise the Delphi panel of experts. The panel of experts would be selected through a snowball sampling event, and by association with the researcher. The researcher has approximately 18 years of employment in the

environmental field to include consulting, education, service to the profession by membership on boards of directors, and working to place graduates from an occupational health and safety undergraduate degree program into entry-level employment as EH&S professionals. Contacts developed during this time in the field will be contacted to gauge interest in serving as a Delphi panelist, and the snowball method of panel selection will be utilized to reach the desired number of 33 panelists. The three critical conditions which were necessary to successfully complete a Delphi study were mediating factors in selecting a panel from the population. According to Delbecq (1986) these conditions were: 1) having adequate time to thoughtfully complete the data gathering instruments, 2) skilled in written communications, 3) highly motivated. In addition to the above-referenced criteria, it was decided that in addition panel inclusion would require hiring authority into the field, continuous employment in the field for at least seven years, and being recognized by the researcher as expert in the environmental field.

Panelists selected for inclusion will be derived equally from three sectors of employers: private employers, government-sector employers in either a federal, state or municipal entity, and non-profit sector employers. Institutional Review Board (IRB) approval was sought and approved. The IRB correspondence including applications and letters of approval for the multiple rounds are attached as appendices A-D.

The procedure for selecting the panel was to begin with a list of potential panelists determined by the researcher. An initial list of 60 names was developed. The researcher telephoned each potential panelist to explain the nature of the research project, why he/she was selected, and to ask if he/she was interested in participating in the project. In

addition, the potential panelist was asked if he/she knew of other persons who should be considered as panelists.

In terms of sampling methods, a combination of a purposive or judgment sample, a stratified sample and a snowball sample were used. A purposive or judgment sample is a sampling technique of selecting members to be representative of the population by the researcher or research committee (Lindenmeier, 1996). The researcher or research committee selects members based on experience, expertise or some other agreed-upon criteria (Lindenmeier, 1996). In addition, a stratified sample technique was used to ensure that representation came from across all three employment sectors. Stratified sampling was also employed to ensure that there was an equal or near equal number of panelists from each of the employment sectors mentioned previously (private/ federal, state, municipal government/ non-profit). Finally, a snowball sampling technique was used. "Snowball sampling identifies a few research subjects who have characteristics relevant to the study and in the process of data collection asks them to name others they know who are like them in the relevant characteristic. The process is repeated until the researcher has obtained the desired number of research subjects" (Chadwick, et al., 1984, p. 66). The term snowball comes from the effect of a small group growing larger by the core of the group continually adding layers to the outside (Chadwick, et al., 1984). It is hoped by this researcher that by utilizing multiple sampling methodologies, a diverse panel of experts from varying employment sectors will comprise the panel.

Research Instrument Development

The round one data gathering instrument was developed immediately following the decision to use the Delphi technique for data gathering. The round one data gathering instrument consisted of seven open-ended questions that asked employers to the environmental profession their opinions on knowledge, skills and abilities, certifications, and college-level coursework required for an entry-level hire. Content analysis of the panelist's responses to the round one questions was performed, and led to the development of a list of themes and supporting statements that were used as the round two instrument.

Data Analysis and Interpretation

After reviewing, sorting and classifying the comments generated in round one by content analysis, the round two questionnaire will be developed. After receiving round two completed rating surveys, descriptive statistics including the mean and standard deviation will be used to determine levels of initial agreement, initial disagreement, and initial resolution of high importance among panelists related to the themes and supporting statements. The mean corresponds to the group opinion of the experts, while the standard deviation (or interquartile range) signifies the degree of disagreement among the panel members. The process ends when consensus is reached or sufficient information has been exchanged. While a three round Delphi is typical, single and double round Delphi studies have also been completed (Krahn, Hartman and Skulmoski (2007). It is crucial that the researcher has enough rounds embedded to allow experts to come to consensus, but not so many that they are lost to attrition (Cowan, 2009).

CHAPTER IV

FINDINGS

This study was conducted to determine what knowledge, skills and abilities, certifications and coursework are most important to employers for entry-level success in the environmental profession. The 33 environmental professionals (panelists) selected participated in equal numbers from the private, government and non-profit sectors (11 each). The panelists selected for inclusion in the study had unifying characteristics including time and willingness to participate, at least seven years in the environmental field, and hiring authority. A classical Delphi study was initiated, with round one activity consisting of open-ended questions submitted via e-mail to the panelists. The panelists responded via e-mail, and their responses were analyzed for content and stratified into themes and supporting statements for a subsequent round two exercise. Round two included a Likert scale instrument, where the panelists rated the identified themes and supporting statements for importance utilizing a five point scale from unimportant to very important/critical. The round two data was analyzed by SPSS 17.0, with the results reported for range, mean and standard deviation. Tables included in this chapter illustrate the panelist's ratings for items of low, medium and high importance relating to an entry-level environmental professional's need to know, need to be able to do, certifications and coursework in college. Table 27 is a proposed competency framework reflecting all data.

Response Rate – Rounds One and Two

Thirty-three panelists (11 each from the private, government, and non-profit sectors) participated in round one of the Delphi study by submitting their answers through e-mail to the initial open-ended questions. This response rate was 100% of the panelists that had originally committed to participation during e-mail and/or telephone discussions with the researcher. The questions comprising round one of the Delphi study are included in Appendix G. The round two survey was completed by 21 of the round one panelists for a 64% response rate. The 21 round two panelists consisted of nine from the private sector (82%), seven from the government sector (64%) and five from the non-profit sector (45%). Factors accounting for panelist attrition from round one to round two included a medical retirement, a job change, supervisor concern that the panelist's participation was not job-related, an extended family vacation away from computer/ internet access, and non-response to the round two survey despite repeated requests from the researcher.

Findings – Round One

The round one survey consisted of four open-ended questions eliciting the panelist's opinions regarding knowledge, skills, abilities, certifications and college-level coursework necessary for entry-level success in the environmental profession. The panelists provided qualitative feedback to each of the four questions, resulting in a total of 539 individual responses consisting of statements, phrases, words, paragraphs, sentences, etc. Question number one was: What does an entry-level environmental professional need to know to be successful in the field? There were a total of 156

individual items extracted from the responses from all 33 panelists. Question number two was: What does an entry-level environmental professional need to be able to do to be successful in the field? There were a total of 122 individual items extracted from the responses from all 33 panelists. Question number three was: What certifications are important for an entry-level environmental professional? There were a total of 89 individual items extracted from the responses from all 33 panelists. Question number four was: What college-level coursework is most helpful for an entry-level environmental professional? There were a total of 172 individual items extracted from the responses from all 33 panelists. All the responses generated are included as Appendix I.

After the panelists had returned their round one surveys via email, the data gathering part of round one was considered complete. The responses generated by the panelists were then printed out in the form of individual statements, phrases, words, thoughts, sentences, etc. and separated, resulting in 539 individual ribbons of printed information corresponding to a panelist's answer to one of the four initial questions. Qualitative content analysis of the open-ended questions followed, with the researcher sorting the individual statements according to themes that emerged as the sorting and content analysis exercise proceeded. The information gathered for questions three and four (certifications and college-level coursework) was not analyzed qualitatively for content, rather listed for subsequent round two consideration by the panelists. Table 1 illustrates the results of the qualitative content analysis performed, and highlights the resulting themes for the question regarding need to know. It should be noted that the tables contain only three representative individual statements supporting the theme. For a complete list of all responses generated in response to question one, see Appendix I.

There were 10 specific themes associated with panelist input to question one, and one theme denoted as outlier statements. This theme contained statements from the panelists that did not fit into any of the previously identified themes.

Table 1
Emergent Themes and Supporting Statements From Round One Question-*What Does An Entry-Level Environmental Professional Need To Know To Be Successful In The Field?*

Theme	Statements
The importance of having a college degree.	Variety of college coursework, skills and experience. Basics of the field, i.e. college background information. The presumption that the entry level professional would be a college graduate.
Variety of college courses focusing on the sciences.	Understanding of basic ecology. Well rounded curriculum of theory based courses. Working knowledge of environmental science which includes all the science disciplines (biology, chemistry, physics, geology, etc.).
Understanding the position.	Be able to understand the industrial operation they are working in and the environmental effects of the operation. Know about the environment where they will be working. General background in issues and circumstances related to his/her chosen field.
Business acumen.	Business acumen. Possess business professionalism . Budget management and cost benefit analysis.
Privileged to be part of the field.	Understand the importance of protecting human health and the environment. First and foremost – dedication to the field. Believe in what you are doing.
Understanding the complex and interrelated nature of the field.	Understanding the way environmental processes work. Must possess ability to see the big picture of a particular issue, including key players, stakeholders, data, regulations, opposition, programs, problem solving, etc. Should be equipped with a fundamental multimedia (air, water, soil) understanding of how environmental issues develop per media and how environmental impacts are mitigated, controlled or remediated.
Governmental regulatory agencies.	Be familiar with OSHA and their relationship with EPA. Understanding of the various government programs which provide funding for land conservation. Learn about state environmental agencies and their missions.
Internship/ experience in the field	Field work, internships, and actual work experience will help prepare students for the work environment that cannot be taught in classrooms. Should have hands-on development experiences including summer jobs in field of study, internships, job shadowing and/or co-op experience. Possess experience including volunteer activities in the field.

Table 1
Emergent Themes and Supporting Statements From Round One Question-*What Does An Entry-Level Environmental Professional Need To Know To Be Successful In The Field?* (continued)

Theme	Statements
Laws	Know the difference between a law, a regulation and a proposed public rulemaking. Understand the environmental laws/programs, different acts and how to comply. Basic understanding of the legislative and regulatory process including federal and state agencies and relevant legislation including CAA, CWA, CERCLA, RCRA, SDWA, SWDA, etc.
Broad/ comprehensive grasp of environmental regulations	Understand the CFR. Know the basic structure of 40CFR and the basic content under each major section. A broad, comprehensive grasp of environmental regulations, including OSHA, EOPA and DOT regulations.
Outlier statements	Know what a work plan is. Basic DOT rules for hazardous materials shipments. Understanding that environmental means from cradle to grave.

Emergent themes supporting question one and the need for aspirants to be knowledgeable in particular areas include a college education including relevant coursework, laws and regulations, experience through internships and/or actual field time, and an understanding of the complexity of the environmental profession.

Table 2 illustrates the results of the qualitative content analysis performed, and highlights the resulting themes for the question regarding need to be able to do. Once again, only three supporting statements are listed in support of the themes. These statements were selected to illustrate panelist's qualifying remarks supporting each theme.

Table 2
Emergent Themes and Supporting Statements From Round One Question-*What Does An Entry-Level Environmental Professional Need To Be Able To Do To Be Successful In The Field?*

Theme	**Statements**
Communicate effectively.	Know how to listen and learn. Writing, speaking and presentation skills. Be able to communicate both orally and written.

Table 2
Emergent Themes and Supporting Statements From Round One Question-*What Does An Entry-Level Environmental Professional Need To Be Able To Do To Be Successful In The Field?* (continued)

Theme	Statements
Interpersonal communication.	Be able to establish a strong rapport with landowners. Have the ability to interact with public agency partners. Relate to people with different perspectives on environmental issues.
Write effectively.	Putting together the final report is the key. Technical writing. Compose technical memorandums and reports.
Have proficiency in computer applications.	Competent in Microsoft office suite. Use a computer. How to specifically navigate government websites.
Work in demanding environments.	Have the physical ability to work in extreme weather conditions. Have a desire to work outside and do manual work. Tolerate extreme weather conditions.
Work collaboratively in a group environment.	Be able to work well with a team or on their own. Participate in strategic planning. Be a team player and possess ability to work with others to create synergy.
Possess a good work ethic.	Be prepared to go to work. Self motivation to succeed. Possess a good work ethic.
Be persuasive.	Have the ability to communicate with workers and clients on the situation that needs to be changed. Be able to work with people and get buy-in. Confident, but not overly confident and persuasive.
Ability to think critically.	Think critically and problem solve. Skills in critical thinking. Read and interpret sections of environmental regulations.
Be flexible.	Multitask. Keep up with changes in an evolving field. Have an open mind – text book is not always the right way in how things work in the field.
Resourcefulness.	Know when to call for help and bring in a professional. Ask questions when they don't know how to do something or don't understand. Ability to assess current compliance areas of concern.
Integrity.	Possess professional ethics. Character is the most important ingredient in preparing for a career in the environment. Possess integrity, trustworthiness.
Outlier statements.	Operate instrumentation specific to the environmental profession. Read and interpret a lab report. Know how to do research.

Table 2 is indicative of panelist's opinions regarding an entry-level environmental professional's skills and abilities. This need to be able to do set of themes and supporting statements reflects a more tactile, active set of criteria than previously associated with question one responses. The importance of communication for entry-level environmental professionals is apparent, and is highlighted in several themes including interpersonal communication, communicating effectively, writing effectively, persuasion, and even computer applications. There are also diverse sets of need to be able to do skills including work in demanding environments, critical thinking, resourcefulness and integrity. The full listing of panelist's responses to question two are included in Appendix I.

The individual statements generated by the panelists in response to question three are included in Appendix I. Highlighted in Table 3 are the emergent themes, or categories of certifications which resulted from content analysis and data sorting of the panelist's round one responses to the question: What certifications are important for an entry-level environmental professional? Included adjacent to the themes are supporting individual certifications and/or statements. It was decided that the round two survey instrument would include all of the individual certifications listed by the panelists for subsequent ranking, and not include the thematic breakdown. It should be noted that the tables contain only a representative sampling of the emergent individual statements supporting the theme. An important theme that emerged regarding necessary certifications, and that was supported by numerous individual statements, was that of "no certification necessary". This is reflective of the panelist's assertion that certifications are not necessarily important for entry-level opportunities in the environmental profession. Representative statements supporting the contention that no certifications are

necessary for entry-level environmental professionals highlighted the panelist's contention that company needs and career path will dictate what certifications are important, and that entry-level certifications are not necessary.

Table 3
Emergent Themes and Supporting Statements From Round One Question-*What Certifications Are Important For An Entry-Level Environmental Professional?*

Theme	Statements
Sustainability.	Green. Green certification. LEED.
All-inclusive.	Certifications and registrations serve as stamps of approval to further demonstrate competency along with experience. Not mandatory here but any environmental certification would be nice. Whatever advanced certifications you can obtain will be of value.
Specialty.	Based on specialization. Depends on the specific discipline they are working in. Specialties depending on the area you are going into.
None needed.	Once part of the team, the company will refine an entry level employees talents by sending them to classes and training. Certifications for entry level generally not required, however memberships in professional organizations are strongly encouraged. Certifications are not really necessary as an entry level person.
Environmental Protection Agency.	Any certification offered by EPA. EPA free or low cost training, some of it online. Certifications offered by EPA and OSHA and other state and federal agencies.
Hazardous Waste Operations and Emergency Response.	HAZWOPR. 40 Hour HAZWOPR. 40 hour HAZWOPR is a great door opener.
Occupational Safety and Health Administration.	Basic OSHA 30hour training course in general industry. OSHA 8 hour. Any available OSHA course.
Registered Environmental Manager.	REM.
Professional Engineer.	EIT. PE. Engineer or geologists need to be certified, especially in the energy industry.
Certified Hazardous Materials Manager.	CHMM. CHMM is valuable but not required.

Table 3
Emergent Themes and Supporting Statements From Round One Question-*What Certifications Are Important For An Entry-Level Environmental Professional?* (continued)

Theme	Statements
Department of Transportation.	Waste shipper to include DOT. 8 hour basic DOT.
Water.	Water/ wastewater license. State and federal discharge permittees that require licenses to operate wastewater treatment plants and their associated analytical labs. Water and wastewater operator's license.
First Aid and Cardiopulmonary Resuscitation.	EMT. First aid and CPR. CPR/AED for professional rescuers.
Degree.	Completed college degree plan related to field they are entering. Degrees are useful in most cases, especially with government jobs. Other than relevant degree, no other certifications are generally required.
Individual classifications not assigned to another area.	Registered Environmental Professional. Certified Pool Operator and chemical safety for pool chemicals and storage. ISO 14000. CPA. Title officers law degree. Software packages certifications (GIS, Environmental engineering, database management). Fire training certifications. Licenses for conducting onsite inspections. Certified Professional in Storm Water Quality. Certified Professional in Range Management. Certified Professional in Erosion and Sediment Control. Certified Erosion, Sediment and Storm Water Inspector. Certified Professional Soils Scientist. Registered Land Surveyor. Registered Landscape Architect. Certified Professional Agronomist. CFM. CECS. Certified Industrial Hygienist. Certified Environmental Professional.

Certification themes and supporting statements listed by the panelists included very specific certifications (CHMM, REM, CIH, CEP) and also more generalized suggestions (any certification offered by EPA, any environmental certification would be nice, based on specialization). There were a variety of certifications listed by the panelists for further consideration in round two, and generally reflected certifications, licensure

and training that were specific to their area of expertise (engineering, industrial hygiene, HAZWOPR).

The individual statements generated by the panelists in response to question four are included in Appendix I. Highlighted in Table 4 are the emergent subjects and supporting coursework which resulted from content analysis and data sorting of the panelist's round one responses to the question: What college-level coursework is most helpful for an entry-level environmental professional? Included adjacent to the subjects column are supporting individual courses extracted from the panelists' responses. It should be noted that Table 4 contains only a representative sampling of the individual courses supporting the subjects. The entire list of all panelist's responses to question four is included in Appendix I.

Table 4
Emergent Subjects and Supporting Courses From Round One Question-*What College-Level Coursework Is Most Helpful For An Entry-Level Environmental Professional?*

Subjects	Supporting Courses
Government.	Basic government civics. Government function.
Speech and communication.	Public speaking. Speech and communication. Public relations.
Technical writing.	Technical writing. Writing and composition. Writing.
Occupational health and safety.	Industrial hygiene. Chemical and personal safety. Toxicology.
Water.	Water sampling classes. Water.
Mathematics.	Mathematics through trigonometry. Math. Solid geometry.

Table 4

Emergent Subjects and Supporting Courses From Round One Question-*What College-Level Coursework Is Most Helpful For An Entry-Level Environmental Professional?* (continued)

Subjects	Supporting Courses
Biology.	Biology. Biology of vertebrates, invertebrates and plants including taxonomy. Biology – field work with ecological training.
Chemistry.	Chemistry including organic. General and organic chemistry. Chemical and biological aspects with rules and regulations.
Physics.	Physics.
Business.	Accounting. Business. Economics.
Broad-based coursework.	Broad background. Broad liberal arts degree can enter the energy profession..
Science.	Natural science. Physical science. Basic sciences.
Research.	Research.
Laboratory Study.	Documentation including chain of custody. Labs with any field work offered.
Energy.	Energy management. Petroleum land management.
Risk.	Risk management. Risk analysis.
Experience in the field.	Internship very appealing to employers. Practicum experience in the potential field of employment.
Waste.	Waste. Hazardous materials and waste.
Regulations.	Air quality regulations. Permits and regulations. Environmental regulations and application.
Environmental.	Basic environmental law. Environmental science. Environmental management.
Ecology.	Ecology. Ecological systems.

Table 4
Emergent Subjects and Supporting Courses From Round One Question-*What College-Level Coursework Is Most Helpful For An Entry-Level Environmental Professional?* (continued)

Subjects	Supporting Courses
Agriculture.	Range management. Agricultural sciences. Agricultural economics.
Engineering.	Civil engineering. Principles of engineering. Engineering related to water supply, treatment, disposal, solid waste management and air pollution control.
Computers.	Computers. GIS. Computer classes in Excel, Word, PowerPoint, GIS.
Geology.	Geology.
Individual courses not assigned to another category.	Archaeology. Adult Education. Accident Investigation. Law. Land surveying. Real Estate. Photography. Air. Planning. History. Construction Project Management. Masters level coursework has become an entry point in most environmental fields, anything less places the applicant in a technician level position.

The last subject area extracted from question four is individual courses not assigned to another category. These are courses listed by a panelist(s) that did not fit neatly into another subject area. This is similar to the theme of outlier statements associated with questions one and two from round one. Panelist's responses to question number four include subjects and courses one would assume an entry-level environmental professional would need to take during their college experience (biology, chemistry, science) but also includes subjects and courses not necessarily considered environmental in nature (government, agriculture, computers). This is indicative of the

diverse, interdisciplinary nature of the environmental profession and possibly 33 panelists comprising three different employment sectors (private, government, non-profit) that require potentially different skill sets to be successful.

Findings – Round Two

After receiving responses from all 33 panelists to the round one questions, data gathering for round one was considered complete. The panelist's responses to the round one questions were stratified into themes and supporting statements by qualitative content analysis, with the resulting information comprising the round two survey instrument. The round two survey instrument was divided into four sections consistent with the overall focus of the study: need to know, need to be able to do, certification and coursework. The round two survey instrument consists of 422 individual statements that are divided by the categories mentioned above. The round two survey instrument is included as Appendix J. A request to modify the originally approved IRB was sought to reflect changes necessitated for the round two survey. Approval from the OSU IRB office was received, and both the request and approval documents are included in Appendix C and D respectively.

Response rates to the round two survey instrument varied by sector, and included an overall response rate of 64% (21 of the original 33 panelists). The response rate was 82% for the private sector (nine of the original 11 panelists), 64% for the government sector (seven of the original 11 panelists) and 45% for the non-profit sector (five of the original 11 panelists). Instructions for round two were included as a cover page to the survey instrument, followed by a 36-page survey. Regarding the themes of need to know

and need to be able to do, the survey consisted of statements supporting individual themes, with instructions to mark an "X" in the box that corresponds with the panelist's opinion of the importance of the statement. Regarding necessary certifications and college-level coursework, the survey consisted of a list of individual certifications and coursework for consideration by the panelists. SPSS 17.0 was used to calculate the n, range, minimum and maximum score, mean and standard deviation for each of the Likert scale statements, including Unimportant = 1, Little Importance = 2, Moderately Important = 3, Important = 4, and Very Important/ Critical = 5. The descriptive statistics generated from the round two survey are included in Appendix K. In addition to Likert scale ratings for the individual statements, panelists were given the opportunity at the end of each individual theme to respond to open-ended questions about the name assigned the theme, additional statements that they would like to add, and any statements that should be removed from consideration. Very little feedback was received from the panelists regarding these additional opportunities for input.

Descriptive statistics considered for further analysis by the researcher in round two included the range, mean and standard deviation. The range reflected the variation in responses for Likert scale ratings, with the maximum range being four (possible ratings from 1-5) and the minimum range being zero (all panelists scoring statement the same resulting in no deviation). The mean reflected the average importance among panelists for an individual item, with 1 being the minimum and 5 being the maximum. The standard deviation is a measure of the spread of scores within a set of data, and reflected the panelist's level of agreement or disagreement as a whole with the theme and/or supporting statement. The researcher defined initial agreement as items with a range of

≤ 2 and a standard deviation of ≤.6. Initial disagreement on themes and/or supporting statements was defined as a range of ≥ 3 and a standard deviation of ≥ 1.0. Themes and/or supporting statements that did not fit into the categories of initial agreement or disagreement were categorized as middle ground due to panelists responding with essentially neither unimportant or very important/critical. Mean overall ratings for individual themes and/or supporting statements, certifications and necessary courses were categorized as initial resolution of high importance if the mean was ≥4.5.

Findings – Round Two: Need to Know

The panelist's responses to the round two survey instrument were analyzed for initial agreement or disagreement and resolution of high importance utilizing descriptive statistics generated by SPSS 17.0. These descriptive statistics included the range, mean and standard deviation. There were 11 themes identified from the round one qualitative data, and each theme was placed in a table with supporting individual statements. The panelists were asked to rate for importance each supporting statement, and at the end of the first section to rate the individual themes. The following tables illustrate the levels of initial agreement, initial disagreement, and resolution for high importance for each individual theme and supporting statements for the category of need to know. Under the heading "panelists" on each table, the term agree indicates initial agreement for the themes and/or supporting statements among panelists based on the criteria discussed earlier. Items under the heading "panelists" denoted by disagree are indicative of initial disagreement among panelists. It should be noted that that the supporting statements in each table are arranged in descending order of mean importance as rated by the panelists.

Individual mean totals attached to any statement are in **BOLD** to reflect an importance ranking by the aggregate panelists between important and very important/ critical. This designation is initial resolution of high importance and reserved for importance means of ≥4.5. Table 5 illustrates the theme *The Importance of Having a College Degree*. Of interest are no items of initial disagreement for this theme.

Table 5
Descriptive Statistics for Supporting Statements to Theme of: *The Importance of Having a College Degree*

Supporting Statement	*Range*	*M*	*SD*	Panelists
Occupational field specific science/ technical background information	2	4.05	.59	Agree
Grounded in a basic natural resources discipline from college	2	3.57	.60	Agree
Formal education based in environmental health	2	3.33	.58	Agree

Note.Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

Table 5 shows three items of initial agreement within the overall theme. There were a total of 11 statements attached to the theme (included in Appendix J), indicating more areas of middle ground among panelists than either initial agreement or disagreement.

The next theme that emerged from the round one data was *A Variety of College Courses Focusing on the Sciences*. There was one item reflecting initial disagreement. Table 6 illustrates the descriptive statistics reflecting initial disagreement among panelists related to the importance of college courses focusing on the sciences.

Table 6
Descriptive Statistics for Supporting Statements to Theme of: *Variety of College Courses Focusing on the Sciences*

Supporting Statement	*Range*	*M*	*SD*	Panelists
Knowledge of prescribed burns including certification and training which is preferable for entry level candidate	4	2.86	1.06	Disagree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

The supporting statement listed in Table 6 details a panelist's response that knowledge of prescribed burns would be good for an entry-level environmental professional to possess. The high standard deviation of 1.06 and relatively low mean of 2.86 shows low importance and high initial disagreement for the importance of this topic, reflecting the overall tendency of the panelists to disagree with this assertion.

Supporting statements reflecting the theme *Privileged to be Part of the Field* and the associated descriptive statistics are below in Table 7. There were eight statements total, with three statements reflecting initial disagreement among panelists, one statement reflecting initial agreement, leaving four statements reflecting middle ground importance.

Table 7
Descriptive Statistics for Supporting Statements to Theme of: *Privileged to be Part of the Field*

Supporting Statement	*Range*	*M*	*SD*	Panelists
Believe in what you are doing.	1	4.60	.50	Agree
First and foremost – dedication to the field.	3	3.71	1.06	Disagree
Anyone entering the environmental profession needs to realize from the beginning that it is a very challenging field. You will never be paid much and you will have to deal daily with those and their politics who don't share the same vision.	4	3.57	1.16	Disagree
Know that pay will not always be the best, but that he/she is working for a higher goal.	4	3.29	1.06	Disagree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

Table 7 contains the supporting statement "believe in what you are doing". This statement has a low standard deviation of .50, a low range of 1, and a high mean of 4.60. This statement reflects that the panelists are in initial agreement that this is indeed a very important if not critical concept for entry-level environmental professionals to grasp. The means were low for the items of initial disagreement (all below 4), indicative of low importance among panelists.

The theme *Internship/Experience in the Field* is illustrated in Table 8. There were 11 supporting statements attached to this theme, however only one statement reflected initial agreement, five statements reflected initial disagreement, leaving five statements of middle ground among panelists.

Table 8
Descriptive Statistics for Supporting Statements to Theme of : *Internships/Experience in the Field*

Supporting Statement	*Range*	*M*	*SD*	Panelists
Field work, internships, and actual work experience will help prepare students for the work environment that cannot be taught in the classrooms.	1	**4.71**	.46	Agree
Have taken field trips during college.	3	3.67	1.15	Disagree
Working in the field is more important than a lot of book work.	4	3.57	1.25	Disagree
Possess experience including volunteer activities in the field.	3	3.43	1.03	Disagree
Be a member of a student chapter organization in field of study.	4	3.38	1.02	Disagree
Work some as project manager.	4	3.06	1.16	Disagree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

The supporting statement reflecting initial agreement concerns field work, internships, and actual work experience. The panelists believed that opportunities for students to actually get out in the field will help them to be successful as an entry-level

environmental professional. The mean is very high and the standard deviation is very low reflecting initial agreement among panelists in this regard. The panelists did not place as much importance on field trips, volunteer activities, student organizations or project manager experience.

Panelist's responses to the theme *Laws* are reflected in Table 9. There were five supporting statements for the theme, and only one item reflecting initial disagreement. The remaining items were categorized as middle ground by the researcher as ranked by the panelists.

Table 9
Descriptive Statistics for Supporting Statements to Theme of : *Laws*

Supporting Statement	*Range*	*M*	*SD*	Panelists
I will try to leave politics out of this discussion, but it is involved in all of our lives. In this profession, we are often dealing with following laws, rules or regulations. And the notion of government's role, and why it is as it is, always comes up.	4	3.48	1.08	Disagree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

Table 10 illustrates one item of initial disagreement among panelists. There were nine supporting statements for the theme *Broad, Comprehensive Grasp of Environmental Regulations*, however no items indicating initial agreement. This leaves eight items of middle ground among panelists, indicating no initial agreement or disagreement for the majority of supporting statements.

Table 10
Descriptive Statistics for Supporting Statements to Theme of : *Broad, Comprehensive Grasp of Environmental Regulations*

Supporting Statement	*Range*	*M*	*SD*	Panelists
Have a goal to comply with regulations.	4	3.48	1.08	Disagree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

Summary Including Table for Need to Know

It is worthy to note that for the initial open-ended question what does an entry-level environmental professional need to know, there were only five items of initial agreement among the panelists from a total of 100 statements. These five items were attached to three themes related to having a college degree, the privilege of working in the environmental field, and having an internship and/or experience in the field prior to seeking employment. There were a total of 11 items reflecting initial disagreement among panelists indicated by high range and high standard deviation. These 11 items were attached to five themes that included having a variety of coursework focusing on the sciences, being privileged to work in the field, having internship and field experience, laws and a comprehensive grasp of environmental regulations. This leaves 84 items of middle ground where the panelists could neither reach initial agreement or disagreement as to their importance. These items of middle ground among panelists were dispersed among themes including *Understanding the position, Business acumen, Understanding the complex and interrelated nature of the field, Governmental regulatory agencies and Outlier statements*. This middle ground among panelists (neither initial agreement nor disagreement) concerning necessary knowledge for entry-level environmental professionals may reflect panelist's opinions that knowledge can be taught and that new hires to the profession will learn those things necessary to be successful.

The remaining table for the need to know question from round one is the compilation of all themes illustrating descriptive statistics reflecting initial agreement, initial disagreement, and initial resolution of high importance. *Outlier Statements* was included as a theme and option for the panelists to capture those statements that emerged

from the round one survey that were not easily categorized under any of the other themes. These items included a diversity of responses including DOT rules, hazardous waste, hazardous materials, the concept of cradle to grave, air and air quality, remedial action, site characterization, corrective action and work plans.

Table 11 is the compilation of panelist's ratings of all the themes attached to the category Need to Know. Included are the descriptive statistics n, range, minimum and maximum ranking, mean and standard deviation. This table is included to give the reader insight to the panelist's overall resolution of high importance, initial agreement, and initial disagreement among themes. The themes are arranged in descending order of mean importance, reflecting the panelist's opinion of initial resolution of high importance.

It was resolved that the theme ranked highest in importance among the panelists also had the lowest standard deviation. The theme of *The Importance of Having a College Degree* was ranked as the most important among panelists, and they also agreed that it was the most important theme. This theme was considered to have initial resolution of high importance, based on the low standard deviation and range, and a mean ≥4.5. The only themes that were ranked for mean importance below a 4 were *Business Acumen, Laws, Privilege of Working in the Field and Outlier Statements.* It is worthy to note that not a single theme from the category of Need to Know met with initial agreement among the panelists. In fact, there was a theme that met with initial disagreement among panelists – *Outlier Statements*.

Table 11
Descriptive Statistics for Themes Related to Initial Question: What Does an Entry-Level Environmental Professional Need to Know to be Successful in the Field?

Themes	*n*	*Range*	*Minimum*	*Maximum*	*M*	*SD*	Panelists
College degree	20	2	3	5	**4.50**	.61	MG
College courses/ sciences	20	2	3	5	4.45	.76	MG
Understanding of position	21	2	3	5	4.24	.62	MG
Regulations	21	2	3	5	4.23	.70	MG
Knowledge of regulatory agencies	21	2	3	5	4.19	.81	MG
Internship/ experience	21	2	3	5	4.05	.74	MG
Understand complex and interrelated nature of field	21	3	2	5	4.00	.89	MG
Business acumen	21	2	3	5	3.95	.86	MG
Laws	21	3	2	5	3.95	.92	MG
Privilege of work in field	21	3	2	5	3.71	.85	MG
Outlier statements	19	4	1	5	3.37	1.07	Disagree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
MG: Middle ground reflecting neither initial agreement nor initial disagreement
Initial resolution of high importance: Mean ≥4.5 indicated in bold

Findings – Round Two: Need to Be Able to Do

In the category of Need to be Able To Do, the panelist's responses to the round two survey instrument were analyzed for initial agreement, initial disagreement, and overall importance utilizing descriptive statistics including the range, mean and standard

deviation. There were 13 themes identified from the round one qualitative data, and each theme was placed in a table with supporting individual statements. The panelists were asked to rate for importance each supporting statement within themes, and each theme in an overall table. Tables 12-23 illustrate the levels of initial agreement, initial disagreement, and importance for each individual theme for the category of Need to be Able To Do. The word "agree" in the last column is indicative of initial agreement for the supporting statement(s) among panelists based on criteria set by the researcher. Items with "disagree" in the last column within the table are indicative of initial disagreement among panelists according to criteria set by the researcher. Statements falling in neither category (initial agreement or disagreement) are classified as middle ground but are not illustrated in the following tables. Middle ground statements are found within the tables included as Appendix J. Items highlighted in **bold** within the tables are indicative of a mean that is ≥4.5, indicative of initial resolution of high importance. These statements have been classified by the panelists as very important, and approaching critical. The first emergent theme in the category of Need to be Able To Do was *Communicate Effectively*. Table 12 illustrates the statistical breakdown, highlighting items of initial agreement. It should be noted that no items of initial disagreement existed. There were two neutral statements, with panelists reaching neither initial agreement nor disagreement.

Table 12
Descriptive Statistics for Supporting Statements to Theme of : *Communicate Effectively*

Supporting Statement	*Range*	*M*	*SD*	Panelists
Know how to listen and learn.	1	**4.86**	.36	Agree
Be able to communicate both orally and written.	1	**4.81**	.40	Agree

Table 12
Descriptive Statistics for Supporting Statements to Theme of : *Communicate Effectively* (continued)

Supporting Statement	*Range*	*M*	*SD*	Panelists
Be able to communicate well. Public speaking, personal conversation and written communications. Good grammar, proper use of punctuation and sentence structure is essential. Person must also possess softer skills of being able to look people in the eye when speaking, no over used phrases like "you know", "right", "got it", "ummm", etc. Be assertive enough to speak up when sharing his or her ideas and humble enough to keep their mouth shut when they don't know have a clue.	2	**4.71**	.56	Agree
Writing, speaking and presentation skills.	1	**4.67**	.48	Agree
Good presentation and training skills will be required in most all positions.	1	**4.52**	.51	Agree
Use of proper grammar.	1	4.48	.51	Agree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

With the exception of *Use of Proper Grammar*, every supporting statement and mean is highlighted in **bold** indicating initial resolution of high importance by the panelists. In fact, reading the other supporting statements, it may have been evident to the panelists that the use of proper grammar was included by reasoning that effective communication skills for an entry-level environmental professional by default include the use of proper grammar. Other emergent supporting statements include important and agreed-upon skills including writing, training, presenting, speaking, etc. It is obvious that the panelists are in agreement that communicating effectively is something an entry-level environmental professional must be able to do.

Table 13 is included below and illustrates panelist's responses to the theme of *Interpersonal Communication*. There were a total of 13 statements in the round two survey for consideration by the panelists, with six statements meeting the criteria for initial agreement among panelists. There were no statements meeting initial disagreement

criteria, leaving seven statements remaining in the middle ground category. No individual statements had a mean above 4.5 within the interpersonal theme, resulting in no statements reaching the level of initial resolution of high importance.

Table 13
Descriptive Statistics for Supporting Statements to Theme of : *Interpersonal Communication*

Supporting Statement	*Range*	*M*	*SD*	Panelists
How to communicate effectively with different people of different backgrounds and educational levels.	1	4.48	.51	Agree
In addition they must be able to interact well with others, including those from other fields and with less technical knowledge.	2	4.43	.51	Agree
Must be a good communicator with the ability to relate to the workforce.	1	4.43	.60	Agree
Listen, be patient and to understand that while you may know a lot about environmental science, the voice of wisdom from an experienced environmental professional is priceless and can teach you many things in the field.	1	4.38	.59	Agree
Have the ability to interact with public agency partners.	1	4.38	.59	Agree
Mediation between inspectors, administrators, legal counsel, and employees, especially if the plan is to move into management.	1	4.19	.51	Agree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

The panelists agreed that *Interpersonal Communication* is important, but not quite as important as the more inclusive theme of *Communicate Effectively* (Table 12).

The theme of *Write Effectively* is detailed in Table 14. There were initially 13 statements supporting the theme, with four meeting the criteria for initial agreement among panelists. All the supporting statements highlighted in Table 14 include means above the threshold of ≥4.5 indicating initial resolution of high importance. In addition, initial agreement was high indicated by means ≤.60 and ranges ≤2. There were initially 13 statements in this category, with four statements classified as initial agreement,

leaving nine statements in the middle ground category. There were no items of initial disagreement among the panelists regarding the theme of *Write effectively*.

Table 14
Descriptive Statistics for Supporting Statements to Theme of : *Write Effectively*

Supporting Statement	*Range*	*M*	*SD*	Panelists
Observe and record accurate and verifiable data and communicate it on to others.	1	**4.85**	.37	Agree
Even though have skills in investigation, due diligence and science if you cannot write the report then they will fail.	2	**4.70**	.57	Agree
Written communication skills are a necessity.	2	**4.70**	.57	Agree
Be able to talk about the problems and explain the rule and environmental regulations and be able to write the report about them.	2	**4.65**	.59	Agree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

Table 15 illustrates the importance of *Having Proficiency in Computer Applications*. There were initially 12 supporting statements under the theme, with four initial agreement items having means above the critical threshold for critical importance. Table 15 illustrates the importance of computer knowledge and skill for entry-level environmental professionals. There were no items of initial disagreement, leaving eight middle ground statements regarding panelist's perceptions regarding the importance of proficiency in computer applications.

Table 15
Descriptive Statistics for Supporting Statements to Theme of : *Have Proficiency in Computer Applications*

Supporting Statement	*Range*	*M*	*SD*	Panelists
Use a computer	1	**4.90**	.30	Agree
Basic computer skills in Word, Excel and Powerpoint	2	**4.76**	.54	Agree
Be proficient at the computer tools and internet applications specific to their line of work	1	**4.62**	.50	Agree

Table 15
Descriptive Statistics for Supporting Statements to Theme of : *Have Proficiency in Computer Applications* (continued)

Supporting Statement	*Range*	*M*	*SD*	Panelists
Competent in Microsoft office suite	2	**4.57**	.60	Agree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

The highest mean for proficiency in computer applications involves the succinct support statement "use a computer". The means detailing other supporting statements are very high (all above 4.57) but do not attain the mean of 4.90. The statement "use a computer" may be so inclusive as to negate additional clarification from the other statements. In any event, the panelists input for the theme of *Have Proficiency in Computer Applications* indicates initial agreement and initial resolution of high importance regarding computer usage for entry-level environmental professionals.

Table 16 details the panelist's thoughts regarding the importance of the ability to *Work in Demanding Environments* for entry-level environmental professionals. There were two items of initial disagreement from a total of eight individual items, with no items containing initial agreement. This leaves six statements in the middle ground category. Many of the statements supporting this theme, and in fact the entire theme, may not be applicable to all environmental professions, and the lack of initial agreement for this theme is reflective of the dichotomy that work in the environmental profession may not necessarily occur outdoors in the environment. The high standard deviations, high ranges, and low means for these supporting statements reflect a theme that, according to the panelists, is not important to or applicable in all areas of the environmental profession.

Table 16
Descriptive Statistics for Supporting Statements to Theme of : *Work in Demanding Environments*

Supporting Statement	*Range*	*M*	*SD*	Panelists
Must be alert to the open environment since laboratory conditions are rarely encountered.	3	3.67	1.02	Disagree
Frequently environmental professionals combine their hobbies with their work – canoeists, hikers, kayakers, hunters, etc.	4	2.75	1.07	Disagree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

The ability of an entry-level environmental professional to *Work Collaboratively in a Group Environment* is a theme that emerged in response to the question "what does an entry-level environmental professional need to be able to do"? Panelist's responses and statistical breakdown are illustrated in Table 17.

Table 17
Descriptive Statistics for Supporting Statements to Theme of : *Work Collaboratively in a Group Environment*

Supporting Statement	*Range*	*M*	*SD*	Panelists
Be able to work well with a team or on their own.	2	**4.62**	.59	Agree
Work well with compliance personnel in the field.	1	4.38	.50	Agree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

There were eight individual supporting statements attached to this theme, with two items of initial agreement and no items of initial disagreement. The statements in Table 17 highlight the importance of working well with a team, on their own, or with compliance personnel in the field.

There were five supporting statements for the theme *Possess a Good Work Ethic*. It is worthy to note that all statements reflected initial agreement, had high means above the threshold of ≥4.5 (initial resolution of high importance) and low ranges reflecting critical importance and agreement by and among the panelists participating in round two. Table 18 illustrates the statements and descriptive statistics in support of the theme

Possess a Good Work Ethic. The supporting statements for the theme are indicative of the importance that the panelists place on working hard, being responsible, motivated and prepared to go to work. Table 18 illustrates initial agreement and high mean importance for all the supporting statements.

Table 18
Descriptive Statistics for Supporting Statements to Theme of : *Possess a Good Work Ethic*

Supporting Statement	*Range*	*M*	*SD*	Panelists
Possess a good work ethic	1	**4.90**	.30	Agree
Be at the ready to learn, work, help and be personable	1	**4.86**	.36	Agree
Need to demonstrate the ability to be a responsible and motivated employee including get to work on time, follow company policy and guidance	1	**4.81**	.40	Agree
Self motivation to succeed	2	**4.81**	.51	Agree
Be prepared to go to work	1	**4.76**	.44	Agree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

Table 19 contains the supporting statement "think critically and problem solve". This is the only statement for the theme *Ability to Think Critically* that met with initial agreement among the panelists. There were 14 statements supporting this theme, however "think critically and problem solve" is so concise, well-stated and inclusive that no other supporting statements were necessary to reflect the intent of the panelists. It should also be noted that no items of initial disagreement existed and that the mean for the statement was 4.71, well above the threshold of important and near the rating of very important/ critical. The range was 1.0 with a standard deviation of .46.

Table 19
Descriptive Statistics for Supporting Statements to Theme of : *Ability to Think Critically*

Supporting Statement	*Range*	*M*	*SD*	Panelists
Think critically and problem solve.	1	**4.71**	.46	Agree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

There were 16 individual panelist statements in support of the theme *Be Flexible*. There were six individual items of initial agreement, with no items of disagreement in this theme. Table 20 illustrates the descriptive statistics and individual statements in support of flexibility for entry-level environmental professionals.

Table 20
Descriptive Statistics for Supporting Statements to Theme of : *Be Flexible*

Supporting Statement	*Range*	*M*	*SD*	Panelists
Be willing to obtain new knowledge, skills and abilities	1	**4.71**	.46	Agree
Be flexible and open to new ideas	1	**4.57**	.51	Agree
Keep up with changes in an evolving field	1	**4.52**	.51	Agree
Have ability to be continually learning	1	**4.52**	.51	Agree
Anyone entering field needs to be flexible and willing to continue learning new issues and technology	1	4.48	.51	Agree
Have an open mind – text book is not always the right way in how things work in the field	2	4.43	.60	Agree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

The supporting statements to the theme of *Be Flexible* illustrate the panelist's responses regarding adaptability. Words including evolving, flexibility, continually learning, open mind, willingness, ability and openness to new ideas permeate the supporting statements of the panelists. There were six statements included in the table, with four of the six highlighted in **bold** reflecting high means. This is indicative of initial resolution of high importance.

Table 21 illustrates the statistical breakdown of supporting statements for the theme *Resourcefulness*. There are eight supporting statements reflecting initial agreement from a list of 11, with no items of disagreement among the table. One statement has a mean meeting the threshold of very important/ critical – "ask questions when they don't know how to do something or don't understand".

Table 21
Descriptive Statistics for Supporting Statements to Theme of : *Resourcefulness*

Supporting Statement	*Range*	*M*	*SD*	Panelists
Ask questions when they don't know how to do something or don't understand	1	**4.71**	.46	Agree
Know what resources are available to act in a timely manner on implementation	2	4.38	.59	Agree
Have the knowledge and skills to research regulations to answer the various concerns for a company	2	4.38	.59	Agree
Have the ability to assess current compliance areas of concern	2	4.33	.58	Agree
Know how to find the requirements of the various agencies	2	4.30	.57	Agree
Should have knowledge of appropriate resources to use and rely on for assistance and legal knowledge updates	2	4.24	.54	Agree
What resources are needed to locate standards	2	4.15	.59	Agree
Possess good organizational and administrative skills	2	4.14	.57	Agree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

The theme of *Resourcefulness* met with initial agreement among panelists, with no items of disagreement present. The entry-level environmental professional should note the agreement among panelists, especially when considering action-type words including act, implement, ask, organize, administrate, find, assess, research, resources, and locate.

Integrity is the theme highlighted in Table 22. All six statements in the table meet the threshold of ≥4.5 for mean, and reflect initial agreement and high importance among

panelists. There were initially nine statements supporting this theme, with six making the list for initial agreement. It should be noted that five of the six statements had a range of 1, with the sixth statement having a range of 2. The standard deviations were also correspondingly low, illustrating relative agreement among panelists.

Table 22
Descriptive Statistics for Supporting Statements to Theme of : *Integrity*

Supporting Statement	*Range*	*M*	*SD*	Panelists
Possess professional ethics.	1	**4.86**	.36	Agree
Possess integrity, trustworthiness.	1	**4.81**	.40	Agree
Admit when they have made a mistake and take ownership.	1	**4.71**	.46	Agree
Be eager, honest, helpful and freely admit when they don't understand something or should make a mistake.	1	**4.70**	.47	Agree
Need to demonstrate the ability to put what they know to work in a professional manner.	1	**4.62**	.50	Agree
Follow directions.	2	**4.62**	.59	Agree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

Table 22 indicates initial agreement, very high importance and no initial disagreement among panelists. The theme of *Integrity* is reflected in wording by the panelists including honest, helpful, eager, admitting mistakes, ethics, ownership, trustworthiness, professionalism, and following directions.

The final theme attached to the question of what an entry-level environmental professional needs to be able to do is the catch-all category of *Outlier Statements*. This theme contains supporting statements and observations by the panelists that did not fit neatly under any of the previously identified themes. There were a total of 15 outlier statements, with the classification of initial agreement and initial disagreement attached to one item each. Table 23 highlights the theme *Outlier Statements* in support of the question what an entry-level environmental professional needs to be able to do to be

successful in the field. It is also of note that no means met the threshold for importance as defined by this researcher.

Table 23
Descriptive Statistics for Supporting Statements to Theme of : *Outlier Statements*

Supporting Statement	*Range*	*M*	*SD*	Panelists
Do phase 1,2,3 cleanup of site.	3	3.30	1.08	Disagree
Field equipment operation and maintenance including ATVs, tractors, dozers, fire trucks, pumps and sprayers.	2	2.90	.55	Agree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

Summary Including Table for Need to be Able To Do

It is worthy to note that for the statistical breakdown of the round two survey question What Does an Entry-Level Environmental Professional Need to be Able To Do, there was only one theme where no items of initial agreement, initial disagreement, nor very high means existed (the theme of *Be Persuasive*). Thirteen individual themes emerged in the "need to be able to do" category, with an associated 139 individual statements (items). 49 items of initial agreement were identified on Tables 12-23. These items were attached to themes involving skills including communication, writing, computers, working collaboratively, work ethic, critical thinking, flexibility, resourcefulness and integrity. There were three individual items reflecting initial disagreement among the panelists, and these items were attached to themes involving outlier statements and working in demanding environments. These items reflecting initial disagreement were highlighted on the accompanying tables, and were indicative of high range and standard deviation. This leaves 87 items of middle ground where the panelists could neither reach initial agreement or initial disagreement. The remaining table for the *Need to Be Able to Do* question posed to the panelists contains descriptive statistics

reflecting initial agreement, initial disagreement and overall importance for all the themes. Table 24 is the compilation of the panelist's ratings. *Outlier Statements* was included as a theme and option for the panelists to capture those statements that emerged from the round one survey that were not easily categorized under any of the other themes, including instrument operation, equipment operation, forms completion, environmental assessments, permit applications, quality assurance operations, audits, phase 1,2,3 assessments, sampling protocols and research. Table 24 is the compilation of all the themes attached to the category Need to Be Able to Do. Included are the descriptive statistics including n, range, minimum and maximum ranking, mean and standard deviation. This table is included to give the reader insight to the panelist's overall level of importance and agreement or disagreement with and among themes.

Table 24
Descriptive Statistics for Themes Related to Initial Question: What Does an Entry-Level Environmental Professional Need to Be Able to Do to Be Successful in the Field?

Themes	*n*	*Range*	*Minimum*	*Maximum*	*M*	*SD*	Panelists
Integrity	21	1	4	5	**4.86**	.36	Agree
Communicate effectively	21	1	4	5	**4.76**	.44	Agree
Possess a good work ethic	21	1	4	5	**4.67**	.48	Agree
Interpersonal communication	21	1	4	5	**4.62**	.50	Agree
Write effectively	21	1	4	5	**4.57**	.51	Agree
Resourcefulness	21	1	4	5	**4.52**	.51	Agree
Ability to think critically	20	1	4	5	**4.50**	.51	Agree
Proficiency with computers	21	2	3	5	4.43	.60	Agree

Table 24
Descriptive Statistics for Themes Related to Initial Question: What Does an Entry-Level Environmental Professional Need to Be Able to Do to Be Successful in the Field? (continued)

Themes	*n*	*Range*	*Minimum*	*Maximum*	*M*	*SD*	Panelists
Work collaboratively	21	2	3	5	4.43	.60	Agree
Be persuasive	21	2	3	5	4.05	.59	Agree
Outlier statements	12	3	2	5	4.00	.85	Disagree
Work in demanding environments	21	3	2	5	3.76	.70	Disagree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

Round Two Results - Certifications

The third open-ended question to the panelists involved the importance of certifications for entry-level environmental professionals. The round one responses led to a listing of 89 individual certifications, which were then consolidated into 44 individual statements, or items for consideration by the panelists in round two. The statistical breakdown of the certification category in total is included in this report in Appendix K, with items of initial disagreement and low importance shown below in Table 24. Of importance in the certification category, and associated individual certifications, is the complete lack of initial agreement regarding any of the certification statements and/or individual items. There are no areas of initial resolution regarding the importance of certifications. In fact, of the 44 individual statements, 19 were initial disagreement statements reflecting disagreement on the part of the panelists regarding the overall importance of these certifications. Also important to note is that not a single listed certification was evaluated as approaching critical importance (≥4.5) by the panelists.

Table 25
Descriptive Statistics for Initial Question: *What Certifications are Important for an Entry-Level Environmental Professional?*

Certifications	*n*	*Range*	*Minimum*	*Maximum*	*M*	*SD*	Panelists
Any certification required by employer or law	19	3	2	5	4.11	1.10	Disagree
First-aid basic	21	3	2	5	3.86	1.01	Disagree
Any hands-on class you can acquire	20	4	1	5	3.80	1.15	Disagree
Any environmental certification	20	4	1	5	3.40	1.10	Disagree
CPR/AED	20	4	1	5	3.40	1.31	Disagree
Licenses needed for conducting onsite inspections	20	4	1	5	3.15	1.27	Disagree
CHMM	20	4	1	5	3.00	1.03	Disagree
Registered Environmental Professional	20	4	1	5	2.90	1.02	Disagree
EIT	20	4	1	5	2.90	1.07	Disagree
PE	20	4	1	5	2.90	1.33	Disagree
Registered Environmental Manager	20	4	1	5	2.75	1.12	Disagree
Certified Environmental Professional	20	4	1	5	2.70	1.03	Disagree
Certified Geologist	20	4	1	5	2.65	1.18	Disagree
Certified Industrial Hygienist	20	4	1	5	2.60	1.14	Disagree
Certified Professional in Storm Water Quality	20	4	1	5	2.55	1.05	Disagree
LEED certification	19	4	1	5	2.32	1.06	Disagree
SHEP	17	4	1	5	2.24	1.09	Disagree
CFM	18	4	1	5	2.17	1.10	Disagree
CPA	21	4	1	5	2.00	1.14	Disagree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

Round Two Findings - College-Level Coursework

The fourth category of questions to the panelists involved the importance of college-level coursework for entry-level environmental professionals. The round one responses generated led to a listing of 172 individual classes, which were then consolidated into 115 individual statements, or items for consideration by the panelists in round two. The statistical breakdown of the coursework category in total is included in this report as Appendix K, with items of initial agreement and initial disagreement shown below in Table 26. There are five listed classes where initial agreement was reached and 20 items where the panelists indicated initial disagreement regarding the importance of the classes to the entry-level environmental professional. The majority of statements were classified as middle ground, with the panelists placing neither initial agreement nor disagreement as to their importance. Also important to note is that of the 115 statements submitted for ranking by the panelists in round two, only five had corresponding means above the threshold of ≥4.5. These all correlated with the five listed classes where the panelists reached initial agreement (science; risk; regulations; environmental classes; computers).

Table 26
Descriptive Statistics for Initial Question: *What College-Level Coursework Is Most Important for an Entry-Level Environmental Professional?*

Subjects/Courses	*n*	*Range*	*Minimum*	*Maximum*	*M*	*SD*	Panelists
Risk	7	1	4	5	**4.71**	.49	Agree
Regulations	7	1	4	5	**4.71**	.49	Agree
Science	5	1	4	5	**4.60**	.55	Agree
Computers	4	1	4	5	**4.50**	.58	Agree
DOT Regulations on Chemical Transportation	19	2	3	5	3.95	.78	Disagree

Table 26
Descriptive Statistics for Initial Question: *What College-Level Coursework Is Most Important for an Entry-Level Environmental Professional?* (continued)

Subjects/Courses	*n*	*Range*	*Minimum*	*Maximum*	*M*	*SD*	Panelists
Speech	20	3	2	5	3.90	1.07	Disagree
Statistics	20	4	1	5	3.75	1.07	Disagree
Ecology	21	4	1	5	3.67	1.06	Disagree
Geology	21	4	1	5	3.62	1.12	Disagree
Public Relations	20	3	2	5	3.55	1.05	Disagree
Field Biology	21	4	1	5	3.52	1.03	Disagree
Business	4	1	3	4	3.50	.58	Agree
Principles of Engineering	20	3	2	5	3.40	1.10	Disagree
Trigonometry	21	4	1	5	3.38	1.02	Disagree
Botany	21	4	1	5	3.38	1.02	Disagree
History of EPA	19	3	2	5	3.32	1.20	Disagree
Limnology	20	4	1	5	3.30	1.03	Disagree
Civil Engineering	20	4	1	5	3.30	1.13	Disagree
Wildlife Biology	21	4	1	5	3.29	1.01	Disagree
Physics	20	4	1	5	3.25	1.12	Disagree
Law	20	4	1	5	3.05	1.19	Disagree
Accident Investigation	20	4	1	5	3.00	1.08	Disagree
Adult Education	21	4	1	5	2.95	1.02	Disagree
History	20	3	1	4	2.80	1.11	Disagree
Marketing	21	4	1	5	2.76	1.09	Disagree

Note. Agree reflects initial agreement among panelists: Range ≤2; Standard Deviation ≤.60
Disagree reflects initial disagreement among panelists: Range ≥3; Standard Deviation ≥1
Initial resolution of high importance: Mean ≥4.5 indicated in bold

Proposed New Competency Framework for Entry-Level Environmental Professionals

The results of the round one Delphi survey led to the development of a round two Delphi survey that included 423 individual statements. These statements were compiled into categories for subsequent importance evaluation including need to know, need to be able to do, necessary certifications and necessary college-level coursework. Panelists were given the opportunity to rate these individual statements on a Likert scale by categories of importance, with the choices being unimportant (1), little importance (2), moderately important (3), important (4), and very important/ critical (5). Statistical analysis was run by SPSS 17.0. The resulting descriptive statistics including the range, mean and standard deviation allowed this researcher to analyze responses from the panelists attaching an overall level of importance to the individual themes and supporting statements. The initial open-ended questions to the panelists were based on necessary knowledge, skills and abilities, but are defined here as competencies. It is clear from the data that overall levels of importance, initial agreement, and initial disagreement can be extracted from the statistics, and it is the suggestion of this researcher that individual themes or items resulting in low range and standard deviation, combined with high means can be construed as a set of entry-level competencies deemed as important (bordering on critical) by the panelists for entry-level success in the environmental profession. These competencies will be denoted as primary competencies, and are illustrated along with their supporting statements of critical importance in Table 27. These proposed primary competencies are listed by theme first, with the accompanying statements considered supporting skills and abilities.

Table 27
Primary Competencies in Rank Order with Supporting Statements of Critical Importance for Entry-Level Environmental Professionals

Competency	*Range*	*M*	*SD*	*Rank*
INTEGRITY	**1**	**4.86**	**.36**	**1**
Be eager, honest, helpful and freely admit when they don't understand something or should make a mistake; Possess professional ethics; Admit when they have made a mistake and take ownership; Possess integrity and trustworthiness; Need to demonstrate the ability to put what they know to work in a professional manner; Follow directions.				
COMMUNICATE EFFECTIVELY	**1**	**4.76**	**.44**	**2**
Be able to communicate well. Public speaking, personal conversation and written communications. Good grammar, proper use of punctuation and sentence structure is essential. Person must also possess softer skills of being able to look people in the eye when speaking, no over used phrases like you know, right, got it, ummm, etc. Be assertive enough to speak up when sharing his or her ideas and humble enough to keep their mouth shut when they don't have a clue; Know how to listen and learn; Good presentation and training skills will be required in most all positions; Writing, speaking and presentation skills; Be able to communicate both orally and written.				
POSSESS A GOOD WORK ETHIC	**1**	**4.67**	**.48**	**3**
Need to demonstrate the ability to be a responsible and motivated employee including getting to work on time, follow company policies and guidance; Possess a good work ethic; Be at the read to learn, work, help and be personable; Self motivation to succeed; Be prepared to go to work.				
INTERPERSONAL COMMUNICATIONS	**1**	**4.62**	**.50**	**4**
WRITE EFFECTIVELY	**1**	**4.57**	**.51**	**5**
Even though have skills in investigation, due diligence and science if you cannot write the report then they will fail; Observe and record accurate and verifiable data and communicate it on to others; Written communication skills are a necessity; Be able to talk about the problems and explain the rule and environmental regulations and be able to write the report about them.				
RESOURCEFULNESS	**1**	**4.52**	**.51**	**6**
Ask questions when they don't know how to do something or don't understand.				
CRITICAL THINKING	**1**	**4.50**	**.51**	**7**
Think critically and problem solve.				
COURSEWORK	**1**	**4.63**	**.53**	**8**
Science; Risk; Regulations; Computers.				

Table 27 should serve to illustrate a new, proposed set of primary competencies that can serve as a blueprint for stakeholders to the environmental profession regarding entry-level opportunities. This has ramifications for students, graduates, curriculum coordinators, employers, parents, department chairs, professors, career counselors, academic advisors and others whose aspirations, or job assists those seeking employment in the environmental profession. Included in Table 27 are the combination of knowledge, skills, abilities, competencies, and courses that the panelists have agreed are important. This proposed set of competencies taken in singular view can be used to focus efforts, time, money, energy and direction. Taken in large view these proposed competencies could potentially serve as the basis for curriculum, course and degree level planning.

CHAPTER V

CONCLUSION AND RECOMMENDATIONS

Introduction

Chapter five is organized into four sections. The first section includes an introduction and overview of the study including the research questions. The second section reports the findings of the study and conclusions relative to the research. Section three includes limitations of the study. Section four contains recommendations and suggests areas for further study.

The purpose of this study was to determine if a group of environmental professionals (panelists) with experience, hiring authority and the willingness to participate could agree on a group of primary competencies for entry-level hires to the field. The Delphi technique was used to solicit panelist's input on the following research questions: 1) What does an entry-level environmental professional need to know to be successful in the field; 2) What does an entry-level environmental professional need to be able to do to be successful in the field; 3) What certifications are important for an entry-level environmental professional; and 4) What college-level coursework is most helpful for an entry-level environmental professional? These questions served as the framework for the study, with the panelist's qualitative responses from round one driving the round two survey. Descriptive statistics were utilized to bring the research to conclusion.

Findings and Conclusions-Round One

Thirty-three panelists participated in round one of the Delphi study by responding to the open-ended questions on entry-level competencies for environmental professionals. These panelists worked in the private, government, and/or non-profit sectors of the environmental profession. Qualitative feedback from the panelists was analyzed for content, and the resultant data was separated into themes and supporting statements.

Question one asked for panelist's opinions on necessary knowledge for entry-level environmental professionals. The responses from the panelists were separated into individual statements, with eleven emergent themes supported by the statements. These emergent themes included the importance of having a college degree, a variety of coursework focusing on the sciences, understanding the position, having business acumen, the privilege of working in the field, understanding the complexity of the field, government regulatory agencies, internships/experience in the field, laws, regulations and a catch-all category called outlier statements by the researcher.

Question two solicited opinion on skills and abilities of entry-level environmental professionals. Panelist's responses were separated by content analysis into 13 themes, with supporting statement underlying each. These themes included effective communication, interpersonal communication, writing effectiveness, proficiency with computers, the ability to work in demanding environments, working collaboratively, work ethic, persuasion, critical thinking, flexibility, resourcefulness, integrity and outlier statements.

Question three in round one of the study asked for panelist opinions on certifications for entry-level hires to the profession. There were approximately 14

categories of certification mentioned by the panelists, with 89 distinct individual certifications mentioned. Certifications ranged from the very specific (CHMM, REM, CIH, CEP) to the very broad (any certification offered by EPA, any environmental certification would be nice, based on specialization).

Question four of the first round of the study involved college-level courses that are necessary for success in entry-level positions. The panelists responded to this question with 172 individual courses. Courses listed by the panelists included science, business, risk, computers, public speaking, technical writing, regulations, agriculture and many others.

Findings and Conclusions-Round Two

After receiving round one survey responses from all 33 panelists, the data gathering part was considered complete. Round one responses were analyzed for content, and stratified into themes and supporting statements for subsequent rating by panelists in round two. The round two survey instrument was divided into four sections consistent with the framework of round one, and sent to the panelists. The panelists then had the opportunity to rate the individual themes and supporting statements (422 total) by importance utilizing a Likert scale instrument. The Likert scale choices were Unimportant (1); Little importance (2); Moderately important (3); Important (4); and Very important/critical (5).

Descriptive statistics including the mean and standard deviation were utilized to rank the panelist's responses of the themes emergent regarding what an entry-level environmental professional needs to know to be successful in the field. The resulting

ranking of importance and initial agreement and/or disagreement among panelists is included in this report as Table 11. The highest importance (mean of 4.50) was accorded the theme of having a college degree. The lowest importance ranking was the theme of outlier statements, with a mean of 3.37. It should be noted that there were no themes in the knowledge category that met with initial agreement by the panelists. The parameters for initial agreement were a range of ≤2 and a standard deviation of ≤.60. The theme of outlier statements did meet with initial disagreement, with a range of 4 and a standard deviation of 1.07.

In contrast to the low levels of agreement which characterized the panelist's opinions regarding the importance of specific knowledge for entry to the environmental profession, the question involving skills and abilities met with resounding initial agreement for 10 of the 13 identified themes. The panelists had initial agreement that themes including integrity, communicating effectively, work ethic, interpersonal communication, writing effectively, resourcefulness, critical thinking, computer proficiency, working collaboratively and persuasion are of high importance. The only themes not meeting with initial agreement by the panelists included flexibility, working in demanding environments and outlier statements. Table 24 in this report details the mean importance rankings and initial agreement and/or disagreement among panelists for the 13 identified themes.

It appeared that the panelists believed entry-level environmental professionals need to possess specific characteristics that involve tactile, kinetic, definable traits. Integrity, communication, work ethic, resourcefulness, critical thinking, persuasion and collaboration are all skills and abilities that entry-level environmental professionals need

to be able to do, or possess, to excel in the field. Integrity is the highest ranked theme for the category, with a mean of 4.86 (bordering on critical) with a standard deviation of .36, well below the threshold that signifies initial agreement among panelists.

The category of certification was interesting relative to the round two efforts of the panelists. The panelists initial input from round one was compiled into 44 individual certifications for consideration in round two. Of the 44 individual statements rated by the panelists, not a single individual certification met with initial agreement by the panelists, and only the statement "any certification required by employer or law" rated above a 4.0 for mean importance by the panelists. The real significance of the findings related to certifications is that the panelists could not reach initial agreement on the importance of a single certification. Thus, indicating that students should carefully consider this before pursuing multiple certifications in hopes of making their resume appealing to a potential employer. One of the emergent themes to the certification category was that of no certification necessary. The fact that this was an emergent theme should serve notice to stakeholders including job-seekers, college students, and entry-level candidates/professionals to place less emphasis on certifications in the initial stages of an environmental career because the qualitative input received in round one indicated entry-level candidates do not need certifications. Instead of certifications for initial focus, the entry-level environmental professional might consider other aspects of the position that were deemed important by the panelists, and strive to develop and highlight those skills and abilities discussed earlier in the study. The certifications will come with time and experience in the field, as the environmental professionals progress through their career and focus on those areas of interest, aptitude and employer need.

Round two descriptive statistics for the importance of college-level coursework, in sync with panelists beliefs regarding certifications, showed little initial agreement and/or importance for the 115 individual classes listed for consideration by the panelists. In fact, only five courses met with initial agreement (business, science, risk, regulations and computers). Of those five classes, only four met with importance ratings above a mean of 4.5 (science, risk, regulations and computers). The panelists reached initial disagreement on 22 classes, which left 88 classes of middle ground that met with neither initial agreement nor disagreement regarding importance among panelists.

It is the belief of this researcher that the panelist's qualitative input from round one, rating exercise in round two, and subsequent descriptive statistical analysis after round two has led to a workable proposed new competency framework for entry-level environmental professionals. This competency framework is included as Table 27, and reinforces the importance of entry-level environmental professionals being able to do many things if they are to succeed in the field. These entry-level competencies are denoted in the table as primary competencies, with the supporting statements considered critical skills and abilities. This can serve as a blueprint for stakeholders to the environmental profession, including students, graduates, curriculum coordinators, employers, parents of environmental program students, department chairs, professors, career counselors, academic advisors and others whose job, mission or purpose is to secure or assist entry-level environmental professionals. To summarize the findings for round one, two and subsequent statistical analysis, the following is offered for consideration. What primary competencies are most important for success as an entry-level environmental professional?

INTEGRITY; VERBAL, WRITTEN AND INTERPERSONAL COMMUNICATION SKILLS; STRONG WORK ETHIC; RESOURCEFULNESS; CRITICAL THINKING; COURSES TO INCLUDE SCIENCE, RISK, REGULATIONS AND COMPUTERS.

Limitations of the Study

One of the limitations of this study is that only 33 environmental professionals were included for participation. Although this number of panelists is considered acceptable in size for a Delphi study, time and cost restraints did in fact limit the panel size. Related to the issue of panel size, is that of geographic location of the panelists. With the exception of one panelist from the non-profit employment sector, the remaining 32 panelists all reside and work in Oklahoma. While this does give a clear indication of the necessary competencies (and expectations) for entry-level environmental professionals in the State of Oklahoma, these findings may not be valid in the remainder of the country or even the region. A larger sample of environmental professionals, drawn from a larger population representing a region or the entire country, could potentially yield different results.

Another limitation of the study was concluding the Delphi technique after round two. Time constraints and deadlines, combined with slow panelist responses for round one and two, necessitated closure of the research after two rounds. While complete consensus (the goal of the class Delphi) was not possible after two rounds, valuable information was obtained and necessitated the formation of the initial agreement, initial disagreement, and initial resolution of high importance categories of classification.

The third limitation of this study was panelist attrition from round one to round two. Round one consisted of 33 panelists, which was 100% of the environmental professionals that had originally agreed to participate. Round two participation had dropped to 21 panelists, or only 64% of the original 33 panelists. In all likelihood the length of the round two survey document (36 pages) was the primary reason for the panelist attrition, however other factors also played a part including a job change, medical retirement, supervisor concern that panelist participation was not job-related, and an extended family vacation away from computer access. This researcher made four attempts to solidify 100% round two participation, but ultimately had to bring data gathering to a close in hopes of meeting impending deadlines.

While every attempt was made to include panelists representing broad sectors of the environmental profession, it is clear that a more random sample drawn from a larger population would lend credence to the study. It is also regrettable that there was such a dropout rate (only 45% of the original) for the non-profit sector. Many stakeholders consider the non-profit to be the true genesis of the environmental profession, and it would have been preferable to have maintained a higher proportion of non-profit representation among panelists for the study. This study did not include panelists from the academic sector, i.e professors, advisors, etc.) Many studies have looked at curriculum requirements for environmental programs, and this researcher believes that although not mutually exclusive, curriculum and employer expectations are best studied separately.

It is also important to note that this study did not arrive at consensus in the classical Delphi sense. Additional rounds for panelist's consideration would have been

desirable, but were not possible given the time constraints. However, initial agreement and even disagreement help to illustrate employer expectations that should prove valuable to stakeholders in the future.

It was also pointed out to this researcher that there appeared to be a bias toward the physical sciences in the panelists, emergent themes, certifications and courses. This has been noted and should be addressed in future studies. Included as panelists perhaps should be environmental professionals utilizing geographic information systems on a daily basis, or working in the management systems of environmental organizations, or social scientists pursuing their profession in the environmental arena.

Finally, this study compiled 33 panelist's opinions regarding necessary knowledge, skills and abilities for entry-level environmental professionals at one point in time. Only the opinions of the 33 panelists were included, and the study was limited by time and the schedules and availability of the panelists. The study was confined to electronic communication through e-mail, with the exception of a couple of phone conversations to clarify a question or statement. It might have been helpful to meet in person to arrive at consensus, but given the geographic dispersion of the panelists this was not practical.

Recommendations and Suggested Further Study

Much remains to be done regarding consensus, opinion, agreement, and criteria for entry-level competencies of environmental professionals. Future studies should include a broader representation of environmental professionals from a larger geographic distribution, drawn from a population with a survey designed to discriminate and include

persons differing in age, gender, experience, etc. For example, it might be helpful to solicit input from persons who have been unsuccessful in their environmental aspirations to determine why they have been unsuccessful. Academic gatekeepers (professors, department chairs, career counselors) might also be considered for inclusion in further studies. Use of the Nominal Group Technique might be desirable to conduct this same type of research in a more personal setting, perhaps over an intense weekend in a workshop setting.

It is hoped that this study has served to move the bar higher regarding entry-level competencies for environmental professionals. The opinions of 33 environmental professionals, all with hiring authority and experience in the field, are valuable to stakeholders, especially recent graduates seeking employment and students navigating curriculum choices. The proposed primary competency framework, including critical skills and abilities should be used as a resource and guide for consideration by stakeholders.

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APPENDICES

Appendix A

HANDWRITTEN FORMS WILL NOT BE ACCEPTED

APPLICATION FOR REVIEW OF HUMAN SUBJECTS RESEARCH
SUBMITTED TO THE
OKLAHOMA STATE UNIVERSITY INSTITUTIONAL REVIEW BOARD
Pursuant to 45 CFR 46

IRB Number

FOR OFFICE USE ONLY

Title of Project: EMPLOYER EXPECTATIONS FOR ENTRY TO THE ENVIRONMENTAL PROFESSION: NECESSARY KNOWLEDGE, SKILLS AND ABILITIES

Is the Project externally funded? ☐Yes X No If yes, complete the following: ☐Private ☐State ☐Federal

Agency: Grant No: OSU Routing No:

Type of Review Requested: ☐Exempt X Expedited ☐Full Board

Principal Investigator(s): *I acknowledge that this represents an accurate and complete description of my research. If there are additional PIs, provide information on a separate sheet.*

Robin Hood Lacy, Jr.		08-13-2010
Name of Primary PI (typed)	Signature of PI	Date
Environmental Sciences Program	Graduate College	
Department	College	
4305 Echohollow Trail Edmond OK 73052	405-359-0202	rlacy@uco.edu
PI's Address (Street, City, State, Zip)	Phone	E-Mail

Required IRB Training Complete: X Yes ☐ No
(Training must be completed before application can be reviewed)

Name of Co-PI (typed)	Signature of Co-PI	Date
Department	College	
PI's Address	Phone	E-Mail

Required IRB Training Complete: ☐ Yes ☐ No
(Training must be completed before application can be reviewed)

Adviser (complete if PI is a student): *I agree to provide the proper surveillance of this project to ensure that the rights and welfare of the human subjects are properly protected.*

Dr. Lowell Caneday		08-13-2010
Adviser's Name (typed)	Signature of Adviser	Date
Leisure Studies	Education	
Department	College	
184 Colvin Recreation Center	405-744-5503	Lowell.caneday@okstate.edu
Adviser's Address	Phone	E-Mail

Required IRB Training Complete: x Yes ☐ No
(Training must be completed before application can be reviewed)

NOTE: If sufficient space is not provided below for a complete answer in sufficient detail for the reviewer to fully understand what is being proposed, please use additional pages as necessary.

1. Describe the purpose and the research problem in the proposed study.

Better understanding the expectations that employers have for entry level environmental professionals regarding knowledge, skills and abilities, especially those environmental professionals that graduate from an institution of higher learning with a degree in either environmental studies or environmental science, can aid in course and program planning. The problem is that although the number of graduates from interdisciplinary environmental programs is growing, few studies have examined whether the education and preparation that graduates receive prepare them for successful environmental careers (Vincent, 2010).

2. (a) Describe the subjects of this study:

1) Describe the sampling population: Participants will be environmental professionals in the State of Oklahoma, in particular the Oklahoma City metro area, that work for private sector employers, government agencies, and/or non-profit environmental organizations.
2) Describe the subject selection methodology (i.e. random, snowball, etc): During the principal investigators' (PI) approximately eighteen years in the environmental health and safety industry, numerous contacts have been made and nurtured. The PI will use purposive and judgmental sampling, supplemented with snowball sampling to select Delphi panelists that meet the agreed-upon criteria for inclusion (hiring authority in the environmental profession; a minimum of seven years experience in the environmental profession; willingness and time to participate, and characterization as expert by the PI).
3) Describe the procedures to be used to recruit subjects. Include copies of scripts, flyers, advertisements, posters or letters to be used: Purposive/judgmental/snowball sampling will be used. The PI will contact individuals who meet the above mentioned criteria for inclusion on the Delphi panel. Meetings may include face-to-face interactions, e-mail, or phone conversations. These environmental professionals will provide contact information for additional Delphi panelists if needed. A script is attached for Delphi panelist recruitment and selection.
4) Number of subjects expected to participate: 30
5) How long will the subjects be involved: Subjects will participate in a series of rounds (as delineated by Delphi method procedures). Depending on the number of rounds and the availability of participants, the subjects will be involved in this research project for approximately 4-6 weeks.
6) Describe the calendar time frame for gathering the data using human subjects: The calendar time frame for gathering data from participants begins in the month of September, 2010 and is anticipated to last through mid-October, 2010.
7) Describe any follow-up procedures planned: According to Loo (2002), a shared characteristic of the Delphi approach is a "final report of results and possible action plans" (p.763). Therefore, the results and any possible action plans will be shared with participants once the data have been analyzed.

(b) Are any of the subjects under 18 years of age? ☐Yes X No
If Yes, you must comply with special regulations for using children as subjects. Please refer to IRB Guide.

3. Provide a detailed description of any methods, procedures , interventions, or manipulations of human subjects or their environments and/or a detailed description of any existing datasets to be accessed for information. Include copies of any questionnaires, tests, or other written instruments, instructions, scripts, etc., to be used.

The researcher will use the Delphi technique to gather the expert opinions of environmental professionals in Oklahoma, and in particular the Oklahoma City metro area, regarding the necessary knowledge, skills and abilities of entry-level environmental professionals. To qualify as an expert and for inclusion as a Delphi panelist, the subject will need a minimum of seven years experience in the environmental field. In addition, the subject will need to possess hiring authority. The subject will also need to possess the time and motivation to complete the survey, and will need to be recognized as an expert in the field by the researcher. In the first round of the Delphi study, the researcher will e-mail open-ended questions (seven total) to the selected panel of thirty environmental experts (see attached). These questions will ask for input regarding the knowledge, skills and abilities needed to gain entry-level employment in the environmental field. Participants will be asked to e-mail back their responses to the researcher, and the results will be compiled and sent back to the participants to gather additional input. This iteration will consist of statements with a five-point Likert scale for the participants to rank responses. This will continue until an acceptable degree of consensus is reached or when the results become too repetitive or when an gridlock is reached.

4. Will the subjects encounter the possibility of stress or psychological, social, physical, or legal risks that are greater than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests? ☐Yes X No

   If Yes, please justify your position:

5. Will medical clearance be necessary for subjects to participate because of tissue or blood sampling, administration of substances such as food or drugs, or physical exercise conditioning? ☐Yes X No

   If Yes, please explain how the clearance will be obtained:

6. Will the subjects be deceived or misled in any way? ☐Yes X No

   If Yes, please explain:

7. Will information be requested that subjects might consider to be personal or sensitive? ☐Yes X No

   If Yes, please explain:

8. Will the subjects be presented with materials that might be considered to be offensive, threatening, or degrading? ☐Yes X No

   If Yes, please explain, including measures planned for intervention if problems occur.

9. Will any inducements be offered to the subjects for their participation? ☐Yes X No

   If Yes, please explain:

   NOTE: If extra course credit is offered, describe the alternative means for obtaining additional credit available to those students who do not wish to participate in the research project.

10. Will a written consent form (and assent form for minors) be used? X Yes ☐No

    If Yes, *please include the form(s). Elements of informed consent can be found in 45 CFR 46, Section 116. Also see the IRB Handbook or webpage* http://compliance.vpr.okstate.edu/IRB/consent.aspx .

    If No, *a waiver of written consent must be obtained from the IRB. Explain in detail why a written consent form will not be used and how voluntary participation will be obtained. Include any related*

material, such as a copy of a public notice, script, etc., that you will use to inform subjects of all the elements that are required in a written consent. Refer to IRB Handbook or webpage http://compliance.vpr.okstate.edu/IRB/consent.aspx.

11. Will the data be a part of a record that can be identified with the subject? X Yes ☐No

If Yes, please explain: Participants will be responding via e-mail to the researcher, and will therefore be known to the researcher. Participants will have anonymity within the Delphi study, and will not know who the other panelists are. After each iteration, the researcher will compile and score the questions. The results will be sent to all participants for continued group communication. No identifiers will be used that would connect a participant to their response. Final results will be reported in aggregate and all identifying communication will be destroyed.

12. Describe the steps you are taking to protect the confidentiality of the subjects and how you are going to advise subjects of these protections in the consent process.

Participants will be ensured of privacy, security and confidentiality as items will be analyzed and scored by the PI and reported in subsequent rounds to all participants without identifiers. All communication materials containing participant names will be viewed only by the PI and will remain in the PI's locked office at work. In addition, a lockable file cabinet dedicated to the research materials will remain in the PI's office ensuring two layers of security (outer, locked door and inner lockable file cabinet). Once the Delphi iterations have been completed and data transcribed to a computer file for reporting results in the aggregate, communication with identifiers will be shredded by a commercial shredder in the Occupational and Technology Education office at the University of Central Oklahoma (HES Building – Room 200). This destruction of identifying materials will take place at the end of the fall semester, 2010.Only aggregate data with no identifying features will be maintained.

13. Will the subject's participation in a specific experiment or study be made a part of any record available to his or her supervisor, teacher, or employer? ☐Yes X No

If Yes, please describe:

14. Describe the benefits that might accrue to either the subjects or society. *Note that 45 CFR 46, Section 46.111(a)(2) requires that the risks to subjects be reasonable in relation to the anticipated benefits. The investigator should specifically state the importance of the knowledge that reasonably may be expected to result from this research.*

Benefits to subjects participating in this study include the opportunity to contribute to the body of knowledge regarding employer expectations for the environmental professional. Subjects participating in this study will also have the opportunity for reflection on their own careers in the environmental profession and to relate to the researcher and fellow professionals those factors that have most contributed to their own success. Triangulation between institutions of higher learning, employers, and students/graduates regarding necessary knowledge, skills and abilities for entry-level environmental professionals will serve to strengthen curriculum and program development efforts. Societal benefits may include environmental professionals entering the field in the future that are better prepared and positioned to tackle the myriad of environmental problems that we currently face.

Concurrence:

Department Head (typed)	Signature	Date	Department
College Dean or Research Director (typed)	Signature	Date	College

Checklist for application submission:

☐Completion of required IRB training (http://compliance.vpr.okstate.edu/IRB/gs-CITI.aspx)
☐Grant Proposal, if research is externally funded*
☐Outline or script of information to be provided prior to subjects' agreement to participate
☐Copies of flyers, announcements or other forms of recruitment
☐Informed consent/assent forms
☐Instrument(s) [questionnaire, survey, tests]
☐Resumes or CV's for all PIs (student or faculty) and advisors (4 page maximum for each)**
☐Department/college/division signatures

*For unfunded research, including student theses and dissertations, no research plan is required, however, detailed information about the research must be provided in the application.

**CVs should highlight the education and research expertise of the researcher. Researchers may submit CVs prepared for federal grant proposals (e.g., NIH, NSF, USDA, etc.).

Number of copies to be submitted:

One (1) fully signed, single sided copy of the application and associated attachments

NOTE:

1. Any changes in the project after approval by the IRB must be resubmitted as a modification for review by the IRB before approval is granted. Modifications do not change the period of initial approval.

2. Approval is granted for one year maximum. Annual requests must be made to the IRB for continuation, as long as the research continues. Forms for continuation and modification are available on the web at http://compliance.vpr.okstate.edu/IRB/forms.aspx.

For assistance, please contact the Office of University Research Compliance at 405-744-3377

Appendix B

Oklahoma State University Institutional Review Board

Date:	Friday, August 27, 2010
IRB Application No	GU108
Proposal Title:	Employer Expectations for Entry to the Environmental Profession: Necessary Knowledge, Skills and Abilities
Reviewed and Processed as:	Exempt

Status Recommended by Reviewer(s): Approved Protocol Expires: 8/26/2011

Principal Investigator(s):

Robin Hood Lacy
4305 Echohollow Trail
Edmond, OK 73052

Lowell Caneday
180 Colvin Center
Stillwater, OK 74075

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

☒ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

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

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 219 Cordell North (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,

Shelia Kennison, Chair
Institutional Review Board

Appendix C

HANDWRITTEN FORMS WILL NOT BE ACCEPTED

OKLAHOMA STATE UNIVERSITY INSTITUTIONAL REVIEW BOARD **APPROVED PROTOCOL MODIFICATION REQUEST FORM**	GU108 **IRB Number**

Title of Project: Employer Expectations for Entry to the Environmental Profession: Necessary Knowledge, Skills and Abilities

Principal Investigator: *I acknowledge that this represents an accurate and complete description of the proposed changes to the research.*

Robin Hood Lacy, Jr. **Name of Primary PI** (typed)*		02/14/2011 Date
Signature of Primary PI		
Environmental Sciences Program Department	Graduate College College	
4305 Echohollow Trail Edmond, OK 73052 PI's Address (Street, City, State, Zip)	405-359-0202 Phone	rlacy@uco.edu E-Mail

Adviser (complete if PI is a student): *I agree to provide the proper surveillance of this project to ensure that the rights and welfare of the human subjects are properly protected.*

Dr. Lowell Caneday **Adviser's Name (typed)**		02/14/2011 Date
Signa□ure of Adviser		
SAHEP – Leisure Studies Department	Education College	
184 Colvin Recreation Center Adviser's Address	405-744-5503 Phone	Lowell.Caneday@okstate.edu E-Mail

- The signature of the Primary (lead) PI for the research is required. If PI is a student, the adviser must also sign. All PIs and adviser will receive notification of modification approval

1. Changes to be made to: (check all that apply)

- ☐ Project Title
- ☐ Principal Investigators (include resumes)
- ☐ Sponsor
- ☐ Estimated # of Subjects
- ☐ Subject Population
- ☐ Vulnerable Subject Population
  - ☐ Decisionally Impaired
  - ☐ Children age 17 or less
  - ☐ Pregnant Women
  - ☐ Prisoners
  - ☐ Other Vulnerable Populations
- ☐ Advisor
- ☐ Subject recruitment
- ☐ Inclusion/Exclusion criteria
- ☐ Research Site(s)
- X Research Procedures
- ☐ Consent form
- ☐ Assent form

4. Describe <u>in detail</u> the proposed changes indicated above.

This research utilizes the Delphi method in order to collect data from environmental professionals working in the private, government, and non-profit sectors. This research solicits their input, insight, beliefs, knowledge, opinions and predictions of the necessary knowledge, skills and abilities for persons entering the environmental profession. The only change to this research is an update in the statements analyzed for the second round, as determined by the feedback provided by Delphi panelists in the first round.

The first round of open-ended questions was approved by the OSU IRB. This second round of questions is based on statements generated in the first round. Consistent with the Delphi approach, statements have been created in a Likert scale format for this round in an effort to seek consensus among the Delphi panelists.

5. Explain the reason (s) for the requested changes.

This request is required as this study utilizes the Delphi approach and subsequent rounds have updated information based on the input of panelists in previous rounds. All round two questions were created due to the feedback provided by panelists in round one.

4. Do these requested changes pose additional risks to subjects? ☐Yes x No

If Yes, please describe the risks and any procedures proposed to address them:

5. Submit all materials that are being revised with changes highlighted.

See attached.

Number of copies to be submitted:
One (1) fully signed, single sided copy of the modification request form and associated attachments.

For assistance, please contact the Office of University Research Compliance at 405-744-3377

Appendix D

Oklahoma State University Institutional Review Board

Date:	Tuesday, March 22, 2011	Protocol Expires:	8/26/2011
IRB Application No:	GU108		
Proposal Title:	Employer Expectations for Entry to the Environmental Profession: Necessary Knowledge, Skills and Abilities		
Reviewed and Processed as:	Exempt **Modification**		

Status Recommended by Reviewer(s) **Approved**

Principal Investigator(s):

Robin Hood Lacy
4305 Echohollow Trail
Edmond, OK 73052

Lowell Caneday
180 Colvin Center
Stillwater, OK 74075

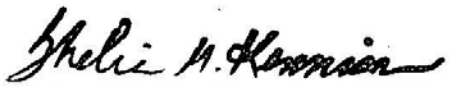
The requested modification to this IRB protocol has been approved. Please note that the original expiration date of the protocol has not changed. The IRB office MUST be notified in writing when a project is complete. All approved projects are subject to monitoring by the IRB.

☒ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

The reviewer(s) had these comments:

The modification request to add the round 2 questions for the Delphi sampling is approved.

Signature :



Shelia Kennison, Chair, Institutional Review Board

Tuesday, March 22, 2011
Date

Appendix E

Recruitment Script

Hello. My name is Robin Lacy and I am an Environmental Science doctoral candidate from Oklahoma State University. I am researching the beliefs held by environmental professionals regarding the necessary knowledge, skills and abilities (KSA) for entry-level employment into the profession. I know that you have worked in the environmental profession for some time, and I am contacting you today to see if you would be interested in participating in a study that I am conducting to gain your expert opinion regarding those KSAs. Criteria for inclusion as a research panelist includes 1) seven years employment in the environmental profession; 2) hiring authority into the environmental profession; 3) the willingness and time to participate, and 4) selection as an expert by the researcher.

This study will be conducted via e-mail. I am using the Delphi method to gain answers to survey questions. The Delphi method uses several rounds of questions to bring the opinions of experts together and attempt to gain a consensus regarding those KSAs that are most important to entry into, and success in, the field. The first round is a set of seven open-ended questions which seek your expert opinion and feedback. After the first round, subsequent rounds will ask you to agree or disagree with specific statements by ranking your input on a scale of 1-5. I anticipate that we will have approximately two or three short rounds over a course of four to six weeks.

As an environmental professional with hiring authority into the field, this is an opportunity for you to share your expertise and to communicate your knowledge to others in an attempt to form a consensus about these very important issues. Your answers and ranking of criteria will never be tied to your name, and will remain confidential to other panelists. I am the only one who will have access to your answers to individual questions. I will compile all results and possible action plans after the study is completed and provide the information back to all participants. My hope is that this research will lead to triangulation between institutions of higher learning, employers, and student/graduates regarding expectations for entry-level employment as an environmental professional. I have a couple of questions to determine your suitability to participate.

How long have you worked in the environmental field?

Do you have hiring authority for entry-level environmental professionals?

Do you have the time (approximately 2-3 hours over a period of 4-6 weeks) for participation?

May I include you in this study?

Do you have any questions for me?

Thank you very much for your time and willingness to participate. I look forward to working with you on this important project. I appreciate in advance your consideration.

Appendix F

Informed Consent

Project Title: Employer Expectations for Entry to the Environmental Profession: Necessary Knowledge, Skills and Abilities.

Investigator: Robin Hood Lacy, Jr., ABD, MS, BS

Purpose: Better understanding the expectations that employers have for entry level environmental professionals regarding knowledge, skills and abilities, especially those environmental professionals that graduate from an institution of higher learning with a degree in either environmental studies or environmental science, can aid in course and program planning. The purpose of this study is to determine the knowledge, skills and abilities environmental professionals find most important for entry into, and success in the field.

Procedures: As a Delphi panelist and participant, you will be asked to respond to a series of short surveys via e-mail (or by mail or fax if you prefer or need). The first survey consists of seven open-ended questions seeking your input and expertise. The following surveys will be based on the answers of all participants to previous surveys, and will include the degree of agreement you have with certain statements on a scale of 1-5. Rounds will continue until participants have reached consensus (or gridlock has occurred). It is anticipated that there will be between two and three rounds of questions over the span of four to six weeks.

Risks of Participation: There are no known risks associated with this project which are greater than those ordinarily encountered in daily life.

Benefits: Benefits to subjects participating in this study include the opportunity to contribute to the body of knowledge regarding employer expectations for the environmental professional. Subjects participating in this study will also have the opportunity for reflection on their own careers in the environmental profession and to relate to the researcher and fellow professionals those factors that have contributed to their success. Triangulation between institutions of higher learning, employers, and students/graduates regarding necessary knowledge, skills and abilities for entry-level environmental professionals will serve to strengthen curriculum and program development efforts. Societal benefits may include environmental professionals entering the field in the future that are better prepared and positioned to tackle the myriad of environmental problems that we currently face.

Confidentiality: Responses to surveys will be sent electronically to the Principal Investigator, Robin Lacy, who will store all data in a locked filing cabinet in a locked faculty office at the University of Central Oklahoma. The Principal Investigator is the only individual who will access the stored data and the only person who will know which participants provided which answers. Hard copies of the data will only be kept until the information is placed in a computer file as a group without any identifiers. At the conclusion of the fall semester, 2010, all communication with key experts' identifying

information will be shredded in a commercial shredder located in the Human Environmental Sciences building, Room 200 at the University of Central Oklahoma. Data and results will be reported as a whole. Experts will be acknowledged, but individual responses with names or identifiers will never be shared or reported.

Compensation: There is no financial compensation for participation in this study and no penalty for refusing to participate. You may quit participating at any time without penalty.

Contacts: If you have questions about this research or about your rights as a research volunteer, you may contact:

Robin H. Lacy, Jr., Principal Investigator
Oklahoma State University
4305 Echohollow Trail
Edmond, OK 73034
405-471-4256
rlacy@uco.edu

Dr. Lowell Caneday, Professor
Oklahoma State University
184 Colvin Recreation Center
Stillwater, OK 74078
405-744-5503
Lowell.caneday@okstate.edu

Dr. Shelia Kennison, IRB Chair
Oklahoma State University
219 Cordell North
Stillwater, OK 74078
405-744-1676
irb@okstate.edu

Participant Rights: Participating in this study is voluntary and participants may discontinue research at any time without reprisal or penalty. There are no risks to withdrawing from the study. Subject participation may be terminated for non-response.

Signature Page

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy of this form has been given to me.

_____ _____

Signature of Participant Date

I do _____/ do not_____ wish to be identified as a key expert in any future published documents.

_____ _____

Signature of Participant Date

I certify that I have personally explained this document before requesting that the participant sign it.

_____ _____

Signature of Researcher Date

Appendix G

Round 1 Delphi Questionnaire

Thank you for your participation in this study, which seeks to gather expert opinion regarding necessary knowledge, skills and abilities for entry-level employment in the environmental profession. Because this study utilizes the Delphi method, you will be asked a series of questions in a few rounds. After each round, your answers and the answers of fellow participants will be analyzed and sent back to you for further revision, ranking and clarification. A five-point Likert Scale will be utilized to determine levels of consensus or dissensus. This study seeks to obtain your insight, beliefs, knowledge, opinions and predictions regarding entry to the environmental profession. Your identity and answers will be kept confidential, and will be known only to the researcher.

Following the model of other studies utilizing the Delphi approach, the first round of questions are open-ended and seek to gain your insight into this issue as an expert in the field. Many of the questions refer to your opinion or knowledge. Please answer thoroughly and provide all information that you deem relevant to the issue of entry-level employment in the environmental profession.

You may answer directly to me in your reply to this e-mail, or you can attach your answers as either a Word of .pdf file. When you have completed the questionnaire, please reply back to me through e-mail at rlacy@uco.edu.

Thank you so much for your time and willingness to participate.

1. What does an entry level environmental professional need to know to be successful in the field?

2. What does an entry level environmental professional need to be able to do to be successful in the field?

3. What certifications are important for an entry-level environmental professional?

4. What college-level coursework is most helpful for an entry-level environmental professional?

5. Is a college degree necessary for employment in the environmental profession?

6. Do you consider employment in the environmental arena to be a profession? Why or why not?

7. Please list/discuss any other issues or additional information that you believe would be helpful to this study.

Appendix H

Hello:

I hope this finds you well. I am sending this e-mail as a follow-up to get your responses to the initial 7 questions contained at the bottom of this e-mail. I am sure that my initial e-mail explaining this was sufficiently unclear, so am resending to solicit your input. As a reminder, I need your responses to the 7 questions contained at the bottom of this e-mail. I appreciate your offer of assistance and willingness to participate initially, but now desperately need your responses to these initial questions. The attachment in Word contains some biographical information and an informed consent page that you can either fax or mail. The fax number is 405-974-3809 (Attention: Robin Lacy) and mailing address is Robin Lacy – Program Coordinator/ Industrial Safety - University of Central Oklahoma – 100 North University Drive - Edmond, Oklahoma – 73034. Either way is fine. The answers to the 7 questions in the body of the e-mail can simply be answered in a reply to this e-mail. Thanks again for your help. If at all possible, I need your responses by Monday, September 27 at 5pm. Have a great weekend.

Robin Lacy

Thank you so much for your willingness to participate in this study. I am attaching as a Word document the recruitment script, informed consent information, and signature page. These documents provide more detail than the initial e-mail I sent you earlier. Would you be so kind as to read the information attached, sign the signature page in the space(s) provided, and return only the signature page to me either by fax at 405-974-3809 or by mail to:

Robin Lacy
Program Coordinator – Industrial Safety
University of Central Oklahoma
100 North University Drive
Edmond, OK 73034

Round 1 Delphi Questionnaire

Thank you for your participation in this study, which seeks to gather expert opinion regarding necessary knowledge, skills and abilities for entry-level employment in the environmental profession. Because this study utilizes the Delphi method, you will be asked a series of questions in a few rounds. After each round, your answers and the answers of fellow participants will be analyzed and sent back to you for further revision, ranking and clarification. A five-point Likert Scale will be utilized to determine levels of consensus or dissensus. This study seeks to obtain your insight, beliefs, knowledge, opinions and predictions regarding entry to the environmental profession. Your identity and answers will be kept confidential, and will be known only to the researcher. Following the model of other studies utilizing the Delphi approach, the first round of questions are open-ended and seek to gain your insight into this issue as an expert in the field. Many of the questions refer to your opinion or knowledge. Please answer

thoroughly and provide all information that you deem relevant to the issue of entry-level employment in the environmental profession.

You may answer directly to me in your reply to this e-mail, or you can attach your answers as either a Word of .pdf file. When you have completed the questionnaire, please reply back to me through e-mail at rlacy@uco.edu.

Thank you so much for your time and willingness to participate.

1. What does an entry level environmental professional need to know to be successful in the field?
2. What does an entry level environmental professional need to be able to do to be successful in the field?
3. What certifications are important for an entry-level environmental professional?
4. What college-level coursework is most helpful for an entry-level environmental professional?
5. Is a college degree necessary for employment in the environmental profession?
6. Do you consider employment in the environmental arena to be a profession? Why or why not?
7. Please list/discuss any other issues or additional information that you believe would be helpful to this study.

Appendix I

Question #1 – What does an entry-level environmental professional need to know to be successful in the field?

1. Well-rounded curriculum of theory based courses.
2. Understanding the way environmental processes work
3. Curriculum that develops the mechanics of environmental processes and then integrates those processes with monitoring, assessment, and management practices.
4. Good writing, speaking, and communication skills
5. Be a member of a student chapter organization in field of study
6. Understand the regulations/guidelines and apply them through permitting, report writing, implementation
7. Basic understanding of different environmental regulations and what agency governs that regulation (rcra, epa, stormwater/npdes-epa,etc)
8. Understanding of the basic environmental elements of focus (land, air and water) and how pollutants can interact with each
9. How to read and interpret laboratory analytical results
10. Proficient with Excel, Word, PowerPoint.
11. Good grasp on understanding how to use GIS tools
12. Good practical science background in order to problem solve (remediation scenarios, chemical mixtures, etc.).
13. Possess a 10,000 foot understanding of the full cycle of the environmental field – how it functions, why and who are involved, how it generates money/sustains jobs, how it can be manipulated and why, what are the technical specialties, where do generalists fit, why is industry generally at odds with public interest groups, how does industry and government work together to collaboratively meet objections, etc.
14. Should be equipped with a fundamental multimedia (air, water, surface and groundwater), waste, and soil (surface/subsurface) understanding of how environmental issues develop per media and how environmental impacts are mitigated, controlled or remediated.
15. What entities are established to regulate, monitor, and minimize environmental impacts and what methods do they employ to accomplish their objectives.
16. To what extent are businesses required to protect the environment and what business strategies and regulatory programs are developed to assist with their responsibilities.
17. Understanding of the industry buzz words for entering a specific field. Example: Phase I ESA

18. Water – process, storm etc.
19. Waste – hazardous, nonhazardous, TSCA, universal, DOT hazardous. What triggers a waste to meet each of the above categories.
20. Air – the understanding of processes that emit pollutants in the atmosphere and some of the more regulated pollutants.
21. The general regulatory environment applicable to the industry of employment. A detailed knowledge of all regulations is generally not expected.
22. A good general knowledge of air, water and land environmental issues related to his/her industry. Most entry level environmental professionals will not be placed in a specific area of interest until he/she has worked as a generalist for a period of induction or orientation. This allows a new environmental professional to get a better general understanding of all fields.
23. Same basic skills as required by any profession.
24. Be able to communicate well. Public speaking, personnel conversation and written communications. Good grammar, proper use of punctuation and sentence structure is essential. Person must also possess softer skills of being able to look people in the eye when speaking, no over use phrases like "you know", "right", "got it", "ummm" etc. Be assertive enough to speak up when sharing his or her ideas and humble enough to keep their mouth shut when they don't have a clue.
25. Know the difference between a law, a regulation and a proposed public rulemaking.
26. Know the basic structure of 40CFR and the basic content under each major section.
27. Understand which states have primacy with the major pieces of environmental legislation.
28. Know the history and the application of the federal laws that established the environmental industry and how they interact together. Having a general understanding of the CWA and CAA along with waste management laws gives the entry level environmental professional an advantage when needing to be considered as a competent professional. Typically the entry level professional will either choose or be directed to one of the three (CAA, CWA, Waste laws) where most competence is demonstrated, but the knowledge of all will continue to serve the professional when needing to make more informed decisions as a whole.
29. Have an open mind – text book is not always the right way in how things work in the field.
30. Understand that people are the first concern followed by the environment.

31. Have understanding of general regulations in the area they will be working and that those regulations change often.
32. How to work
33. Basics of the field i.e. college background education
34. Know how to listen and learn.
35. Two key elements: first is a detailed understanding of the rules and regulations of the various regulatory agencies. It is not necessary to know all rules and regs for all regulatory agencies, just those that the individual will be dealing with on a daily basis. In particular the local municipality, residing state and any/all federal environmental regulatory agencies.
36. Second key element: certain level of business acumen and understanding of office protocol. The individual must be able to work individually and within teams, while understanding how to deal with office personalities and operate within defined boundaries.
37. Should be well grounded in a science oriented discipline. Could be chemistry, biology, geology, environmental science, or engineering. A college degree in one of those fields should be a starting point for an environmental professional. If engineering is the discipline, civil or environmental would be preferred.
38. A broad comprehensive grasp of environmental regulations, OSHA and DOT regulations.
39. The ability to apply regulations in various situations. At a minimum they should know what regulations apply to their specific field of work.
40. Chemistry and biology are very important for the environmental professional.
41. Math and industrial hygiene.
42. Business acumen.
43. Testing, sampling and remediation protocols for various environmental hazards and safety measures that should be taken in various situations.
44. Need basic scientific background, e.g., chemistry, physics, biology, ecology, geology, mathematics and statistics.
45. Basic understanding of the legislative and regulatory process including federal and state agencies and relevant legislation including CAA, CWA, CERCLA, RCRA, SDWA, SWDA, etc.
46. Basic environmental law/programs
47. Technical writing
48. How to listen and learn
49. How to communicate effectively
50. How to establish a training program
51. How to do internet research

52. How to specifically navigate government websites
53. Possess professional ethics
54. Possess experience including hazardous materials
55. Possess experience including volunteer activities in the field
56. Working in the field is more important than a lot of book work.
57. Possess a basic historical knowledge of the energy sector
58. Understand the importance of protecting human health and the environment
59. Learn about pollution and classes of pollutants and their effect on human health
60. Learn about EPA and their mission and enforcement regulations
61. Understand the CFR
62. Learn about state environmental agencies and their missions
63. Be familiar with OSHA and their relationship with EPA

64. Understand the environmental laws different acts and how to comply
65. Have a good relationship with management, operation team and regulatory agencies.
66. Should be versed in several areas depending on the nature of the job they hope to attain.
67. Need to understand air, water, land permitting and the regulations guiding them.
68. Common acronyms used in the standards and their inherent meaning.
69. Permit application and chronic document (Form R, Tier II, waste and emission inventories, etc.)
70. Pitfalls that can cause non-compliance.
71. Should know how to conduct audits.
72. Knowledge of environmental sampling techniques and equipment used to detect pollutants. Lab analysis process and evidence preservation.
73. Know what to expect when and inspection occurs and how to handle situations that arise
74. Budget management and cost benefit analysis
75. Forecasting
76. Chemical and personal safety
77. Proper PPE selection
78. Hazardous materials awareness
79. Hazard communication
80. Basic DOT rules for hazardous materials shipments
81. Competent in Microsoft office suite
82. Use of proper grammar

83. English composition
84. Knowledge of interpersonal communication
85. Corrective action management
86. Mediation between inspectors, administrators, legal counsel, and employees, especially if the plan is to move into management
87. Basic understanding of the sciences, especially chemistry, biology and the geosciences.
88. Possess decent math skills
89. Must be alert to the open environment since laboratory conditions are rarely encountered
90. Risk evaluation is a critical skill
91. Confident, but not overly confident and persuasive
92. Possess basic understanding of chemistry, physics, natural science, biology, mathematics acquired from college courses.
93. Basic understanding to complete forms including Form Rs, Tier 2s, etc.
94. Due diligence of records
95. How to handle different instrumentation
96. BS degree at a minimum but AAS might be OK
97. Degree plan in environmental science a plus
98. Skill and ability to interpret technical data
99. Communication skills to inform/convince upper management of regulatory requirements
100. Ability to read and interpret 40CFR regulations.
101. Strong understanding of land conservation issues within his/her geographic territory.
102. Be familiar with real estate transactions, due diligence, and conservation easements.
103. Basic understanding of tax laws (donations and sales of assets) is helpful.
104. Understanding of the various government programs which provide funding for land conservation is very important.
105. Be prepared to go to work
106. Be prepared to soak up any training and ojt experience.
107. Attitude and personality can really help one starting in the field
108. The presumption that the entry level professional would be a college graduate
109. Grounded in a basic natural resource discipline from college
110. Formal education based in environmental health
111. Have hands-on experience through internships, job shadowing, etc.
112. Should have knowledge of appropriate resources to use and rely on for assistance and legal knowledge updates.

113. How to communicate effectively with people of different backgrounds and educational levels
114. Occupational field specific science/technical background information
115. Understanding of the workplace environment and the different management structures and styles that one may encounter in an entry level job
116. An accurate understanding of the position description for the postion held, and the employer's expectations and performance measures used to define, measure and evaluate success for the position held
117. Good work ethic and self motivation to succeed
118. Know the key terms that are used in the field
119. What resources are needed to locate standards
120. Understanding of what is expected in that position and some linear knowledge of the field so when hired can focus on the direct impacts of the job
121. First and foremost – dedication to the field
122. Know that pay will not always be the best, but that he is working for a higher goal
123. Needs a basic understanding not only of his area of work, but also of the people he will be working with
124. Working knowledge of environmental science which includes all the science disciplines (biology, chemistry, physics, geology, etc) as well as math and social studies
125. Where to find information regarding specific environmental issues
126. Writing, speaking and presentation skills
127. Know about the environment where they will be working
128. Ability to work with the changing environmental factors and no two situation will ever be the same
129. Understanding of basic ecology
130. Understanding of sampling and monitoring procedures for plants, animals and populations
131. Basic computer skills in Word, Excel and Powerpoint
132. Field equipment operation and maintenance including ATVs, tractors, dozers, fire trucks, pumps and sprayers
133. Knowledge of prescribed burns including certification and training which is preferable for entry level candidate
134. Invasive species management
135. GIS experience a big plus
136. Degree in a related science such as range management, biology, ecology, etc.

137. For non preserve specific positions, same degree requirement, with more specialization in the field of interest for the position – aquatic ecology or monitoring biology or species management (elk, bison) ecology
138. Have an open mind, ready to learn in addition to their academic training
139. Be able to adapt to policies and procedures required by employer
140. Be eager, honest, helpful and freely admit when they don't understand something or should make a mistake
141. Keep an open a the ready mind/attitude and if the leadership of that agency/company is similar to your own style, that will help ou to become part of the team
142. Never ask questions about the pay, how many days off, benefits, etc. Those things will take care of themselves.
143. Technical academic course work related to air quality
144. Work experience related to air quality
145. Variety of college course work, skills and experience.
146. Proficiency in use and editing on various types of computer software including word processing, spreadsheets, adobe file management, database, image making, file management, contacts and calendar management, GIS, website software, slide preparation. Most government agencies utilize Microsoft Office software, Adobe and ESRI GIS. Must have skills include Office suite software coming in, it is no longer acceptable to assume that will be OJT deliverable.
147. General background in issues and circumstances related to his/her chosen field.
148. Knowledge of local, state and federal rules and regulations, policies and guidance documents about the field. Gain this knowledge quickly, and helpful if the ELEP already had a basic familiarity. These will be essential later in the career. The successful environmental professional cannot glass over the regulations, guidance and policy. The successful environmental professional must "play lawyer" often.
149. Another skill needed is in data interpretation including statistical analysis of hard numbers from instruments and lab reports.
150. Also analysis of date related to standards, policies and permits.
151. Basic knowledge of general statistics
152. Skills in critical thinking
153. Be able to generate graphs, tables of data, perform basic statistics and offer general interpretation.
154. High level of quality assurance (QA) on all data collection and data use activities. Assist with preparation of QA plans, set up sampling programs in accordance with standards, and interpret QA data.

155. Must possess ability to see the big picture of a particular issue. Know the key players including stakeholders and what hard data say, what regulations require, how corrective actions might be financed, what sorts of opposition might be generated, what solutions might help those affected, what organizations and programs are available to possibly assist in problem solving, and how other programs and parties are affected secondarily by environmental decisions.
156. Have ability and good judgment to see all aspects of the environmental issue, sort through the depth of complexity, and help organize partners and resources to solve environmental problems.

Question #2 – What does an entry level environmental professional need to be able to do to be successful in the field?

1. To be successful an individual needs to be able to deal with regulatory agency personnel on an inter-personal level and be able to show a detailed understanding of the project and relevant regulations
2. Possess good work ethic
3. Have experience working
4. Have good educational background in the field
5. Must have open mind
6. Must be client friendly
7. Possess ability to explain their concerns about a particular project and be able to explain and suggest several options for completion
8. Need to understand men do not like being told what to do
9. Obtain more training/education for upward mobility and security
10. Certifications and registrations serve as stamps of approval to further demonstrate competency along with experience.
11. Higher learning in the form of advanced degrees are likewise very important to success and security
12. Read a technical report and/or permit and write an executive summary
13. Read and interpret a lab report
14. Know there are different EPA laboratory methods and how to look up the methods
15. Read and interpret sections of environmental regulations
16. Follow directions
17. Ask questions when they don't know how to do something or don't understand
18. Admit when they have made a mistake and take ownership
19. Must be a good communicator with the ability to relate to the workforce
20. Good presentation and training skills will be required in most all positions.
21. Needs to be flexible with schedule and ability to travel freely on short notice
22. Have the knowledge and skills to research regulations to answer the various concerns for a company.
23. Be willing to learn and understand that with environmental responsibilities, one is always learning.
24. Apply a baseline understanding of their specific area of interest so that employers can springboard from a basic level of preparedness. Baseline understanding should include knowledge of industry buzz words/terms/processes of specific areas of interest and familiarity with the

types of documentation (permits, usage reports, spill plans, emission inventories, technical reports, etc.) required.

25. Be proficient at the computer tools and internet applications specific to their line of work.
26. Be flexible – what you are trained for often leads you down a road of unexpected professional development.
27. Think critically and problem solve
28. Articulate scenarios and opinions in writing and verbally to others of varying stature within an organization
29. Use terminology the general populace can understand and relate to
30. Multitask
31. Be able to communicate with others and grow their knowledge base.
32. Learn how to sell capabilities and maintain client relationships
33. Should have hands/on development experiences including summer jobs in field of study, internships, co-op experience.
34. Have broad grasp of environmental regulations
35. Have the ability to assess current compliance areas of concern
36. Work well with compliance personnel in the field
37. Have experience as an intern
38. Have taken field trips during college
39. Operate instrumentation specific to the environmental profession
40. Observe and record accurate and verifiable data and communicate it on to others.
41. Tolerate extreme weather conditions
42. Know how to do research
43. Be able to read and produce maps
44. Be able to properly fill out permit applications and monthly and annual inventories
45. Identify areas of non-compliance during a mock audit or inspectioin
46. Successfully argue to merits (sway management) of an environmental program
47. Discuss applicable portions of environmental, transportation, and safety standards for a known chemical shipment
48. Demonstrate creation of a professional memorandum or business letter and powerpoint program
49. Listen, be patient and to understand that while you may know a lot about environmental science, the voice of wisdom from an experienced environmental professional is priceless and can teach you many things in the field
50. Prove that they are a team player

51. Be able to understand the industrial operation they are working in and the environmental effects of the operation
52. Understand the CFR
53. Be able to talk about the problems and explain the rule and environmental regulation and be ale to write the report about them
54. Have a goal to comply with regulations
55. Keep the manager informed of environmental issues and encourage them to minimize polluting activities
56. Have a vision and the drive and willingness to learn something new.
57. Be willing to evolve
58. Have a willingness to learn
59. Have the physical ability to work in extreme weather conditions
60. Possess integrity, trustworthiness.
61. Possess maturity.
62. Possess the desire to want to improve the environment and to try to protect what we have.
63. Keep up with changes in an evolving field.
64. Be willing to do the research
65. Believe in what you are doing
66. Have a positive attitude
67. Participate in strategic planning
68. Know how to handle emergencies
69. Know how to handle high stress situations
70. Understand public perception vs. reality
71. Take in information and process it
72. Make a decision, defend/debate a point
73. Collaborate and work as a group
74. Ability to research
75. Compose technical memorandums and reports
76. Interpret data
77. Utilize software including GIS, spreadsheets, and databases
78. Know when to call for help or bring in a professional
79. Be able to perform basic sampling of water, soil and application of basic environmental remediation protocols
80. Perform environmental assessments to include risk and permitting needs
81. Know how to improve our environment through sustainable efforts such as energy management and natural resource management
82. Be able to investigate and evaluate environmental conditions in terms of the applicable regulatory requirements, as well as those of clients.
83. Know how to find the requirements of the various agencies

84. Needs an ability to write in clear, concise idiomatic English in order to produce reports that are useful
85. Be able to communicate both orally and written
86. Be a team player/ability to work with others creates synergy
87. Have the academic background your degree indicates you have. Be able to do all things your college degree trained you to do.
88. Keep working and increasing your mastery of those skills with additional training and study.
89. Have a good work ethic
90. Possess a personality that allows you to work well with others
91. Be able to establish a strong rapport with landowners, generally rural.
92. Need to be willing to spend a great deal of time outdoors.
93. Have the ability to interact with public agency partners
94. Have the ability to communicate well, both orally and written
95. Possess good organizational and administrative skills
96. Have working knowledge of GIS platforms, digital photographs, video, work with a variety of specialized field equipment
97. Ability to work in the field, including good mobility and flexibility, enjoy being outdoors, tolerate difficult environmental conditions, access unusual structures, knowledge of basic natural hazards, and have taken comprehensive field safety training
98. Ability to network with a variety of partners and mobilizing a variety of resources
99. Be at the ready to learn, work, help and be personable.
100. Be able to problem solve
101. Be able to work well with a team or on their own
102. Communicate well in writing and orally
103. Work with equipment
104. Use a computer
105. Learn by listening and following
106. Be adaptable and flexible
107. Have a desire to work outside and do manual work
108. People with problems working with other people need not apply
109. Be flexible and open to new ideas
110. Have ability to be continually learning
111. Communication is vital
112. Possess business professionalism
113. Relate to people with different perspectives on environmental issues
114. Apply environmental issues to a person's everyday life and understand how does the issue affect the person socially, economically and culturally

115. Be willing to obtain new knowledge, skills and abilities
116. Be able to work with people and get buy-in
117. Make assessments and react to them without delay
118. Know what resources are available to act in a timely manner on implementation
119. Have the ability to communicate with workers and/or clients on the situation that needs to be changed
120. Need to demonstrate the ability to put what they know to work in a professional manner
121. Need to be able to demonstrate competence in both the academic exercise and practical application of field specific technical information and processes.
122. Need to demonstrate the ability to be a responsible and motivated employee including get to work on time, follow company policy and guidance.

Question #3 – What certifications are important for an entry-level environmental professional?

1. Field specific certifications issued by professional societies or National or state certification agencies.
2. Any certifications required by the employer or law for the field.
3. Training and certification in software packages (GIS, Environmental engineering, database management) essential to job performance is useful as well.
4. CPR/AED for Professional rescuers
5. First Aid basic level certification – instructor level to start training employees would be good
6. OSHA 8-hour
7. Certified pool operator and chemical safety for pool chemicals and storage
8. Depends on the specific discipline they are working in
9. Basic OSHA 30-hour training course in general industry
10. HAZWOPR
11. Any available OSHA course
12. Any certification offered by EPA
13. Other than relevant degree, no other certifications are generally needed
14. Fire training certifications
15. Completed college degree plan related to field they are entering
16. Once part of the team, the company will refine an entry level employees talents by sending them to classes and training
17. State and federal discharge permittees that require licenses to operate wastewater treatment plants and their associated analytical labs
18. Licenses needed for conducting onsite inspections
19. PE
20. Interim status PE
21. EIT
22. PE
23. CPESC – Certified Professional in Erosion and Sediment Control
24. CPSS – Certified Professional Soils Scientist
25. APAg – Certified Professional Agronomist
26. CPSWQ – Certified Professional in Storm Water Quality
27. CESSWI – Certified Erosion, Sediment and Storm Water Inspector
28. CPSC – Certified Professional Soils Correlator
29. RLA – Registered Landscape Architect
30. RLS – Registered Land Surveyor
31. CPRM – Certified Professional in Range Management

32. CIH – stepping stone to being recognized as knowledgeable and capable in the field
33. Certifications are things an entry level professional works toward. Previous certifications, such as PE, should not be a requirement. Environmental certification should be stand alone, not an add on.
34. CHMM
35. Registered Environmental Professional
36. SHEP
37. Water and Wastewater Operators License
38. Laboratory Licenses
39. HAZWOPR 40 hour
40. Degrees are useful in most cases, especially with government jobs
41. 40 hour HAZWOPR should be required for all
42. Universities need to develop training certification programs and refreshers for each of required training elements
43. EMT First Responder
44. Water/Wastewater license
45. HAZMAT Training is a big plus
46. EPA free or low cost training, some of it online
47. Engineers or geologists need to be certified, especially in the energy industry
48. Accountants need CPA
49. Title officers – law degree
50. Certifications offered by EPA and OSHA and other state and federal agencies
51. CHMM
52. Internships and experience mean more than certifications, and certifications usually take a few years of experience to qualify anyway
53. HAZWOPR
54. 40 hour HAZWOPR is a great door opener
55. CHMM is valuable but not required
56. LEED Certification
57. Green Certification
58. Not mandatory here (government) but any environmental certification would be nice.
59. 30 hour General Industry Training Card (OSHA)
60. HAZWOPR
61. ISO 14000 Training
62. PE
63. CHMM
64. CFM
65. REM

66. CECS
67. HAZWOPR
68. CPR Training
69. CHMM
70. REM
71. EIT
72. Whatever advanced certifications you can obtain will be of value
73. Waste shipper to include DOT
74. Certifications for entry level generally not required, however memberships in professional organizations are strongly encouraged
75. Certifications are not really necessary as an entry level person. Begin working toward a certification early in a persons career. May distinguish them when it comes time for a lay off or give them an edge. Participation in a professional organization is at least as valuable as getting the certification
76. HAZWOPR
77. HAZWOPR
78. First Aid and CPR
79. Specialties depending on the area you are going into.
80. Based on specialization
81. 40 hour HAZWOPR
82. 8 hour basic DOT
83. REM
84. CHMM
85. EMT
86. Any hands on class i.e. highway, railroad, chlorine, etc.
87. Certified Environmental Professional
88. Registered Environmental Manager
89. Dependent on the actual arena within which the individual operates. Certifications required by the local or state agencies, asbestos, USTs,

Question #4 – What college level coursework is most helpful for an entry level environmental professional?

1. Science
2. Chemistry
3. Geology
4. Math
5. Chemistry
6. Physics
7. Natural Science
8. Biology
9. Mathematics
10. Basic Sciences
11. Math through Trig
12. Technical Writing
13. Land surveying
14. Geology
15. Environmental standards
16. Permits and Regulations
17. Chemical Fate and Transport
18. Risk Analysis
19. Environmental Law
20. Environmental Management
21. Environmental Audits
22. Environmental Science
23. Environmental Politics
24. Environmental Site Assessment
25. Environmental Risk Assessment
26. Environmental Chemistry
27. Environmental Ethics
28. Petroleum Land management
29. Energy Management
30. Broad liberal arts degree can enter the energy profession
31. Labs with any field work offered
32. Water sampling classes
33. OSHA Safety Rules and Regulations
34. Lab and Chemical Safety
35. Safety in the field and confined space entry
36. PPE
37. Documentation including chain of custody
38. DOT regulations on transporting chemicals

39. Air Quality Regulations
40. History of EPA
41. Chemistry of Hazardous Materials
42. Toxicology
43. HAZWOPR
44. Industrial Hygiene
45. Technical Writing
46. Management
47. Basic Environmental Law
48. Chemistry
49. Biology
50. Construction Project Management
51. Marketing
52. Adult Education (how to educate adults effectively)
53. Speech and Communication
54. Accident Investigation
55. Basic Government Civics
56. Chemistry
57. Physics
58. Biology
59. Ecology
60. Geology
61. Mathematics
62. Statistics
63. Computers
64. Composition
65. Principles of Engineering
66. Industrial Hygiene
67. Chemistry
68. Biology
69. Risk Management
70. Energy Management
71. Regulations
72. Phase I and II Assessments
73. Mathematics through trigonometry
74. Solid Geometry
75. Statistics
76. Chemistry including organic
77. Biology – field work with ecological training
78. Geology

79. Engineering related to water supply, treatment, disposal, solid waste management and air pollution control
80. Technical writing
81. Photography
82. Chemical and design aspects with elements of rules and regulations
83. Chemical and biological aspects with rules and regulations
84. Science or math classes
85. Regulatory oversight classes
86. OSHA safety classes
87. Physical science
88. Chemistry
89. Biology
90. Physics
91. Mathematics
92. Technical writing
93. Public speaking
94. Chemistry
95. Biology
96. Math
97. Environmental regulations and application
98. Waste
99. Air
100. Water
101. Internship is very appealing to employers
102. Chemistry
103. Biology
104. Computer classes in excel, word, ppoint, GIS
105. Government – regulatory framework for rulemaking who governs what
106. Chemistry
107. Biological sciences
108. Archaeology
109. History
110. Technical writing
111. Wetland/botany and wildlife related
112. Environmental policy
113. State and federal regulations and laws
114. Hazardous materials and waste
115. Ecological systems
116. General and Organic Chemistry
117. Environmental Sustainability

118. English composition
119. Writing
120. Environmental courses
121. Agronomy
122. Soils
123. Biology
124. Chemistry
125. Hydrology
126. Forestry
127. Ag engineering
128. Civil engineering
129. Geology
130. Economics
131. Weed science
132. Range science
133. Limnology
134. Environmental Science
135. Agricultural Sciences
136. Agricultural Economics
137. Business
138. Accounting
139. Law
140. Real Estate
141. Broad background
142. Regulations
143. Government Function
144. Chemistry
145. Math
146. Statistics
147. Biology
148. Ecology
149. English
150. Public speaking
151. Technical writing
152. Community Involvement
153. Ecology
154. Biology of vertebrates, invertebrates and plants including taxonomy
155. Range Management
156. Ecology
157. Field Biology

158. GIS
159. Chemistry
160. Biology
161. Agronomy
162. Soil Science'
163. Public Relations
164. Research
165. Environmental Safety
166. HAZCOM
167. HAZWOPR
168. Masters level coursework has become an entry point in most environmental fields, anything less places the applicant in a technician level position
169. Writing and composition
170. Research
171. Field Specific Science or Technical coursework
172. Practicum experience in the potential field of employment

Question #5 – Is a college degree necessary for employment in the environmental profession?
Yes - 25
Yes – 8

Question #6 – Do you consider employment in the environmental arena to be a profession?
Yes - 32
No - 1

Question #7 – Please list/ discuss any other issues or additional information that you believe would be helpful to this study.

1. Need a policy or environmental law question
2. How important thorough understanding of environmental regulations is to the industry.
3. Have lots of environmental exposure in the college setting
4. 3 basic environmental classes that last at least one semester
5. 49 CFR class.
6. Environmental field belongs in an organization with health and safety professionals since these areas are constantly interacting.
7. Few safety, health or environmental issues stand alone
8. A number of ways for a person to enter the profession. Get a certificate at a tech school and become a technician.
9. College degree in environmental science or management could enable a person to move into management.
10. Character is the most important ingredient in preparing for a career in the environment
11. Our company evaluates people on their ability to meet their goals and objectives and give equal weight to five basic intangibles – external focus, clear thinker, imagination, inclusiveness, expertise
12. I am humble to be part of the field
13. Key to success is an individual knowledge of the field in which they work and the individuals interpersonal skills
14. The need for environmental professionals to have good communication skills
15. The ability to understand and produce technical reports cannot be overstated
16. In addition they must be able to interact well with others, including those from other fields and with less technical knowledge
17. Anyone entering field needs to be flexible and willing to continue learning new issues and technology
18. Air quality becoming very important to EPA
19. Understanding COE rules and regulations have been very important over last few years
20. Environmental effects need to be controlled by enforced regulations set by EPA through 40CFR. Therefore the environmental professional needs to understand these regs and environmental permitting
21. Field work, internships, and actual work experience will help prepare students for the work environment that cannot be taught in classrooms
22. OJT
23. Understanding that environmental means from cradle to grave
24. By the nature of events we are held to a higher standard

25. Sustainability
26. Green
27. Economics
28. Planning
29. Business
30. Social, Economic and Environment are the three legs to development – need to understand this
31. Some like field work but it is mostly paperwork
32. Putting the final report together is the key
33. Even though have skills in investigation, due diligence and science if you cannot write the report then they will fail
34. Written communication skills are a necessity
35. Work some as project manager
36. Do phase 1,2,3 cleanup of site.
37. Know what a workplan is
38. Know what a site characterization is
39. Know what remedial action is
40. Can they work 24/7 and quickly and professionally produce a product that will stand up in court. Have in mind that their findings could end u in court
41. Hardest thing right now is that companies are looking for 5+ years of experience.
42. Start in a similar industry and cross train
43. Someone desiring work in the environmental field should have the necessary coursework, experience in the field, research, class activities, summer jobs and internships.
44. Make good grades, get experience and take bonus courses such as a useful foreign language and GIS. Experience with farm/ranch equipment is helpful also.
45. It is my observation that sometimes professionals in environmental fields lack the social and communication skills to interact effectively with the general public. I believe that at the heart of many environmental problems and challenges are people problems that you solve with education and communication.
46. I would hope that this study might explore and ultimately encourage training and education relative to building good communication skills for those pursuing degrees and professional employment in the environmental field.
47. You are dealing with a subject too many people think is simple, and in reality it is extremely complex.
48. Turf battles exist between many registrations and certifications and will not likely be overcome soon.
49. I would say that people involved in the natural resources professions tend to be the most satisfied with their jobs. This has been documented in the federal government, and I suspect it is also true in the private sector.

50. I will try to leave politics out of this discussion, but it is involved in all of our lives. In this profession, we are often dealing with following laws, rules or regulations. And the notion of governments role, and why it is as it is, always comes up.
51. The environmental arena can be divided into several categories, each of which is very different. Environmental advocacy, environmental education, environmental sciences, land conservation, watershed conservation, urban planning/conservation. The skills and qualifications vary considerably among them.
52. Anyone entering the environmental needs to realize from the beginning that it is a very challenging field. You will never be paid much and you will have to deal daily with those and their politics who don't share the same vision.
53. The environmental professional experience often leads to more job opportunities that a student did not necessarily think of in college.
54. There is a steady, if not increasing, demand for environmental professionals.
55. Diversity of skills helps facilitate new career options
56. Coupling an environmental degree and experience with an engineering degree and registration as PE opens many new door for career options.
57. Frequently environmental professionals combine their hobbies with their work – canoeists, hikers, kayakers, hunters, etc.
58. What draws us all to this arena is our love of nature, and our dedication to protecting the environment that we have learned to love on a deeper level because of our scientific understanding of its intricacy and beauty.

Appendix J

Dear Delphi Panelist:

Hello and welcome to round two of my dissertation research project. I hope this finds you well, enjoying the spring weather and glad that winter has finally loosened its grip. I appreciate in advance your willingness to continue as a participant in this important project. The attached ranking exercise contains the themes, statements and information that you found important for an entry-level environmental professional. This exercise will now give you the opportunity to attach a level of importance to the themes, statements and information as I attempt to gain consensus among the group. I have attached the ranking in two ways: as a Microsoft WORD document; and as an Adobe .pdf file. I have done this to offer you the maximum flexibility for accessing and completing the exercise. If you have any questions or concerns about this round two exercise, please do not hesitate to contact me at this e-mail address, or on my mobile phone at 405.471.4256. If you will be unable to participate in round two, please let me know ASAP. Thank you again!

Robin Lacy

Project Title: Employer Expectations for Entry to the Environmental Profession: Necessary Knowledge, Skills and Abilities

DELPHI – ROUND TWO RANKING EXERCISE

April 1, 2011

Dear Delphi Panelist:

Hello and welcome to round two of this research project. Thank you in advance for your willingness to continue as a participant. This package contains the themes and supporting statements (sub items) that emerged from the round one questions. As a reminder, there were four open-ended questions in round one: 1) What does an entry level environmental professional need to know to be successful in the field? 2) What does an entry level environmental professional need to be able to do to be successful in the field? 3) What certifications are important for an entry level environmental professional? 4) What college level coursework is most helpful for an entry level environmental professional? There are four sections that correspond to the round one questions and comprise this round two ranking exercise. The sections are NEED TO KNOW, NEED TO BE ABLE TO DO, CERTIFICATIONS, and COLLEGE LEVEL COURSES. Your tasks are to complete the ranking templates for the supporting statements and overall themes in Sections 1 and 2, and then complete the ranking templates for Sections 3 and 4. The themes in Sections 1 and 2 were chosen by me to illustrate and support the nature of your statements. Your Likert Scale choices for ranking statements, themes, certifications and courses are:

Unimportant ● Little Importance ● Moderately Important ● Important ● Very Important/ Critical

The estimated time for you to complete this round two ranking exercise is approximately two hours. Once you have completed the ranking exercise, return to me in one of three ways: 1) complete the ranking exercise in the Word document attached, save your answers, and return to me at rlacy@uco.edu ; 2) complete the ranking exercise, print out your answers, and fax to me at 405.974.3809; 3) complete the ranking exercise, print out your answers, and return by mail to:

Mr. Robin H. Lacy, Jr.
Program Coordinator – Industrial Safety
University of Central Oklahoma
100 North University Drive
Edmond, OK 73034

Once again, thank you for taking the time to participate in this research project, which I hope will assist stakeholders to the environmental profession in the future. Remember to feel free to respond openly and honestly, since your identity will remain anonymous. I would very much appreciate your thoughtful responses and a completed round two ranking exercise returned to me by April 15. This will allow time for round three if necessary. I have taken the liberty of attaching the ranking exercise in both Microsoft WORD and .pdf formats so you can choose the easiest way to complete the exercise. Thank you so much for your time and efforts.

Robin Lacy

SECTION 1 – NEED TO KNOW

THEME: THE IMPORTANCE OF HAVING A COLLEGE DEGREE

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed knowledge for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Degree in a related science such as range management, biology, ecology, etc.					
2. College degree in environmental science or environmental management.					
3. Occupational field specific science/technical background information.					
4. Variety of college course work, skills and experience.					
5. Have the academic background your degree indicates you have. Be able to do all things your college degree trained you to do.					
6. Basics of the field i.e. college background education.					
7. The presumption that the entry level professional would be a college graduate.					
8. Higher learning in the form of advanced degrees is very important to success and security.					
9. For non preserve specific positions, same degree requirement, with more specialization in the field of interest for the position – aquatic ecology or monitoring biology or species management ecology.					
10. Formal education based in environmental health.					
11. Grounded in a basic natural resources discipline from college.					

Do you think that a better or more descriptive name for the theme THE IMPORTANCE OF HAVING A COLLEGE DEGREE exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO KNOW to be successful in the field? ___YES ___NO
If YES, what statement(s) would you add?

Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: VARIETY OF COLLEGE COURSES FOCUSING ON THE SCIENCES

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed knowledge for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Should be well grounded in a science oriented discipline. Could be chemistry, biology, geology, environmental science, or engineering. A college degree in one of those fields should be a starting point for an environmental professional.					
2. Working knowledge of environmental science which includes all the science disciplines (biology, chemistry, physics, geology, etc.) as well as math and social studies.					
3. Understanding of basic ecology.					
4. Math and Industrial Hygiene.					
5. Knowledge of prescribed burns including certification and training which is preferable for entry level candidate.					
6. A number of ways for a person to enter the profession. Get a certificate at a tech school and become a technician.					
7. Make good grades, get experience and take bonus courses such as a useful foreign language and GIS.					
8. Curriculum that develops the mechanics of environmental processes and then integrates those processes with monitoring, assessment, and management practices.					
9. Possess a basic historical knowledge of the energy sector.					
10. Risk evaluation is a critical skill.					
11. Well rounded curriculum of theory based courses.					
12. Hazard communication.					
13. Sustainability.					
14. Invasive species management.					
15. Technical academic course work related to air quality.					
16. Water – process, storm, etc.					
17. Forecasting.					

Do you think that a better or more descriptive name for the theme VARIETY OF COLLEGE COURSES FOCUSING ON THE SCIENCES exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO KNOW to be successful in the field? ___YES ___NO
If YES, what statement(s) would you add?
Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: UNDERSTANDING THE POSITION

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed knowledge for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Be able to understand the industrial operation they are working in and the environmental effects of the operation.					
2. Understanding of the industry buzz words, key terms and acronyms for entering a specific field. Example: Phase I ESA.					
3. Same basic skills as required for any profession.					
4. An accurate understanding of the position description for the position held, and the employer's expectations and performance measures used to define, measure and evaluate success for the position held.					
5. Understanding of what is expected in that position and some linear knowledge of the field so when hired can focus on the direct impacts of the job.					
6. Know about the environment where they will be working.					
7. General background in issues and circumstances related to his/her chosen field.					
8. Needs a basic understanding not only of his area of work, but also of the people he will be working with.					

Do you think that a better or more descriptive name for the theme UNDERSTANDING THE POSITION exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO KNOW to be successful in the field? ___YES ___NO
If YES, what statement(s) would you add?
Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: BUSINESS ACUMEN

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed knowledge for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. To what extent are businesses required to protect the environment and what business strategies and regulatory programs are developed to assist with their responsibilities.					
2. Basic understanding of tax laws (donations and sales of assets) is helpful.					
3. Due diligence of records.					
4. Business acumen.					
5. Be familiar with real estate transactions, due diligence, and conservation easements.					
6. Budget management and cost benefit analysis.					
7. Possess business professionalism.					

Do you think that a better or more descriptive name for the theme BUSINESS ACUMEN exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO KNOW to be successful in the field? ___YES ___NO
If YES, what statement(s) would you add?
Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: PRIVILEGED TO BE PART OF THE FIELD

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed knowledge for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Understand the importance of protecting human health and the environment.					
2. Anyone entering the environmental profession needs to realize from the beginning that it is a very challenging field. You will never be paid much and you will have to deal daily with those and their politics who don't share the same vision.					
3. What draws us all to this arena is our love of nature, and our dedication to protecting the environment that we have learned to love on a deeper level because of our scientific understanding of its intricacy and beauty.					
4. First and foremost – dedication to the field.					
5. By the nature of events we are held to a higher standard.					
6. Possess the desire to want to improve the environment and to try to protect what we have.					
7. Know how to improve our environment through sustainable efforts such as energy management and natural resource management.					
8. Know that pay will not always be the best, but that he/she is working for a higher goal.					
9. Believe in what you are doing.					

Do you think that a better or more descriptive name for the theme PRIVILEGED TO BE PART OF THE FIELD exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO KNOW to be successful in the field? ___YES ___NO
If YES, what statement(s) would you add?
Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: UNDERSTANDING THE COMPLEX AND INTERRELATED NATURE OF THE FIELD

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed knowledge for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Understanding the way environmental processes work.					
2. Environmental field belongs in an organization with health and safety professionals since these areas are constantly interacting.					
3. Strong understanding of land conservation issues within geographic territory.					
4. Learn about pollution and classes of pollutants and their effect on human health.					
5. Must possess ability to see the big picture of a particular issue. Know the key players including stakeholders and what hard data say, what regulations require, how corrective actions might be financed, what sorts of opposition might be generated, what solutions might help those affected, what organizations and programs are available to possibly assist in problem solving, and how other programs and parties are affected secondarily by environmental decisions.					
6. Should be equipped with a fundamental multimedia (air, water, surface and groundwater), waste, and soil (surface/subsurface) understanding of how environmental issues develop per media and how environmental impacts are mitigated, controlled or remediated.					
7. Apply a baseline understanding of their specific area of interest so that employers can springboard from a basic level of preparedness. Baseline understanding should include knowledge of industry buzz words/terms/processes of specific areas of interest and familiarity with the types of documentation (permits, usage reports, spill plans, emission inventories, technical reports, etc.) required.					

Do you think that a better or more descriptive name for the theme UNDERSTANDING THE COMPLEX/ INTERRELATED NATURE OF THE FIELD exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO KNOW to be successful in the field? ___YES ___NO
If YES, what statement(s) would you add?
Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: GOVERNMENTAL REGULATORY AGENCIES

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed knowledge for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Be familiar with OSHA and their relationship with EPA.					
2. Understanding of the various government programs which provide funding for land conservation is very important.					
3. Understand which states have primacy with the major pieces of environmental legislation.					
4. Learn about EPA and their mission and enforcement regulations.					
5. What entities are established to regulate, monitor, and minimize environmental impacts and what methods do they employ to accomplish their objectives.					
6. Learn about state environmental agencies and their missions.					

Do you think that a better or more descriptive name for the theme GOVERNMENTAL REGULATORY AGENCIES exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO KNOW to be successful in the field? ___YES ___NO
If YES, what statement(s) would you add?
Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: INTERNSHIP/ EXPERIENCE IN THE FIELD

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed knowledge for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Field work, internships, and actual work experience will help prepare students for the work environment that cannot be taught in classrooms.					
2. Should have hands-on development experiences including summer jobs in field of study, internships, job shadowing and/or co-op experience.					
3. Someone desiring work in the environmental field should have the necessary coursework, experience in the field, research, class activities, summer jobs and internships.					
4. Have taken field trips during college.					
5. Possess experience including volunteer activities in the field.					
6. Be a member of a student chapter organization in field of study.					
7. Work experience related to air quality.					
8. Have experience working.					
9. Work some as project manager.					
10. OJT.					
11. Working in the field is more important than a lot of book work.					

Do you think that a better or more descriptive name for the theme INTERNSHIP/EXPERIENCE IN THE FIELD exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO KNOW to be successful in the field? ___YES ___NO
If YES, what statement(s) would you add?
Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: LAWS

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed knowledge for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Know the history and the application of the federal laws that established the environmental industry and how they interact together. Having a general understanding of the CWA and CAA along with waste management laws gives the entry level environmental professional an advantage when needing to be considered as a competent professional. Typically the entry level professional will either choose or be directed to one of the three (CAA, CWA, Waste Laws) where most competence is demonstrated, but the knowledge of all will continue to serve the professional when needing to make more informed decisions as a whole.					
2. I will try to leave politics out of this discussion, but it is involved in all of our lives. In this profession, we are often dealing with following laws, rules or regulations. And the notion of government's role, and why it is as it is, always comes up.					
3. Understand the environmental laws/programs, different acts and how to comply.					
4. Know the difference between a law, a regulation and a proposed public rulemaking.					
5. Basic understanding of the legislative and regulatory process including federal and state agencies and relevant legislation including CAA, CWA, CERCLA, RCRA, SDWA, SWDA, etc.					

Do you think that a better or more descriptive name for the theme LAWS exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO KNOW to be successful in the field? ___YES ___NO
If YES, what statement(s) would you add?
Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: BROAD/ COMPREHENSIVE GRASP OF ENVIRONMENTAL REGULATIONS

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed knowledge for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. A broad comprehensive grasp of environmental regulations, including OSHA, EPA and DOT regulations.					
2. Need to understand air, water, land permitting and the regulations guiding them.					
3. Understanding COE rules and regulations have been very important over last few years.					
4. Understand the CFR.					
5. Have a goal to comply with regulations.					
6. Pitfalls that can cause non-compliance.					
7. Two key elements – first is a detailed understanding of the rules and regulations of the various regulatory agencies. It is not necessary to know all rules and regulations for all regulatory agencies, just those that the individual will be dealing with on a daily basis. In particular the local municipality, residing state and any/all federal environmental regulatory agencies.					
8. Know the basic structure of 40CFR and the basic content under each major section.					
9. Knowledge of local, state and federal rules and regulations, policies and guidance documents about the field. Gain this knowledge quickly, and helpful if the entry level environmental professional already had a basic familiarity. These will be essential later in the career. The successful environmental professional cannot glass over regulations, guidance and policy. The successful environmental professional must "play lawyer" often.					

Do you think that a better or more descriptive name for the theme BROAD/COMPREHENSIVE GRASP OF ENVIRONMENTAL REGULATIONS exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO KNOW to be successful in the field? ___YES ___NO
If YES, what statement(s) would you add?
Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: OUTLIER STATEMENTS

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed knowledge for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Basic DOT rules for hazardous materials shipments.					
2. Waste – hazardous, nonhazardous, TSCA, universal, DOT hazardous. What triggers a waste to meet each of the above categories".					
3. Hazardous materials awareness.					
4. Understanding that environmental means from cradle to grave.					
5. Air – the understanding of processes that emit pollutants in the atmosphere and some of the more regulated pollutants.					
6. Air quality becoming very important to EPA.					
7. Know what remedial action is.					
8. Know what a site characterization is.					
9. Corrective action management.					
10. Know what a work plan is.					

Do you think that a better or more descriptive name for the theme OUTLIER STATEMENTS exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO KNOW to be successful in the field? ___YES ___NO
If YES, what statement(s) would you add?
Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEMES – WHAT DOES AN ENTRY-LEVEL ENVIRONMENTAL PROFESSIONAL NEED TO KNOW TO BE SUCCESSFUL IN THE FIELD

Review the list of themes that emerged from the round one questions. Beside each theme, mark an "X" in the box that best represents your opinion of the importance of the theme as needed knowledge for an entry-level environmental professional.

THEMES	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
College degree					
College courses/ sciences					
Understanding of position					
Business acumen					
Privilege of work in field					
Understand complex and interrelated nature of field					
Knowledge of regulatory agencies					
Internship/ experience					
Laws					
Regulations					
Outlier statements					

SECTION 2
NEED TO BE ABLE TO DO

THEME: COMMUNICATE EFFECTIVELY

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed skills and abilities for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Be able to communicate well. Public speaking, personnel conversation and written communications. Good grammar, proper use of punctuation and sentence structure is essential. Person must also possess softer skills of being able to look people in the eye when speaking, no over used phrases like "you know", "right", "got it", "ummm", etc. Be assertive enough to speak up when sharing his or her ideas and humble enough to keep their mouth shut when they don't know have a clue.					
2. It is my observation that sometimes professionals in environmental fields lack the social and communication skills to interact effectively with the general public. I believe that at the heart of many environmental problems and challenges are people problems that you solve with education and communication.					
3. I would hope that this study might explore and ultimately encourage training and education relative to building good communication skills for those pursuing degrees and professional employment in the environmental field.					
4. Know how to listen and learn.					
5. Good presentation and training skills will be required in most all positions.					
6. Writing, speaking and presentation skills.					
7. Be able to communicate both orally and written.					
8. Use of proper grammar.					

Do you think that a better or more descriptive name for the theme COMMUNICATE EFFECTIVELY exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO BE ABLE TO DO to be successful in the field?
___YES ___NO
If YES, what statement(s) would you add?

Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: INTERPERSONAL COMMUNICATION

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed skills and abilities for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Be able to establish a strong rapport with landowners, generally rural.					
2. Relate to people with different perspectives on environmental issues.					
3. In addition they must be able to interact well with others, including those from other fields and with less technical knowledge.					
4. How to communicate effectively with different people of different backgrounds and educational levels.					
5. Must be a good communicator with the ability to relate to the workforce.					
6. Listen, be patient and to understand that while you may know a lot about environmental science, the voice of wisdom from an experienced environmental professional is priceless and can teach you many things in the field.					
7. Have the ability to interact with public agency partners.					
8. Mediation between inspectors, administrators, legal counsel, and employees, especially if the plan is to move into management.					
9. To be successful an individual needs to be able to deal with regulatory agency personnel on an inter-personal level and be able to show a detailed understanding of the project and relevant regulations.					
10. Learn how to sell capabilities and maintain client relationships.					
11. A positive attitude and personality can really help one starting in the field.					
12. Understanding of the workplace environment and the different management structures and styles that one may encounter in an entry level job.					
13. Have a good relationship with management, operation, and regulatory agencies.					

Do you think that a better or more descriptive name for the theme INTERPERSONAL COMMUNICATION exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO BE ABLE TO DO to be successful in the field?
___YES ___NO
If YES, what statement(s) would you add?
Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: WRITE EFFECTIVELY

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed skills and abilities for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Even though have skills in investigation, due diligence and science if you cannot write the report then they will fail					
2. Observe and record accurate and verifiable data and communicate it on to others.					
3. Putting together the final report is the key.					
4. Technical writing.					
5. Compose technical memorandums and reports.					
6. Read a technical report and/or permit and write an executive summary.					
7. Needs an ability to write in clear, concise idiomatic English in order to produce reports that are useful.					
8. Can they work 24/7 and quickly and professionally produce a product that will stand up in court. Have in mind their findings could end up in court.					
9. Written communication skills are a necessity.					
10. Be able to read and produce maps.					
11. Demonstrate creation of a professional memorandum or business letter.					
12. Be able to talk about the problems and explain the rule and environmental regulation and be able to write the report about them.					
13. Articulate scenarios and opinions in writing and verbally to others of varying stature within an organization.					

Do you think that a better or more descriptive name for the theme WRITE EFFECTIVELY exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO BE ABLE TO DO to be successful in the field?
___YES ___NO
If YES, what statement(s) would you add?

Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: HAVE PROFICIENCY IN COMPUTER APPLICATIONS

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed skills and abilities for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Proficiency in use and editing on various types of computer software including word processing, spreadsheets, adobe file management, database, image making, file management, contacts and calendar management, GIS, website software, slide preparation. Most government agencies utilize Microsoft Office software, Adobe and ESRI / GIS. Must have skills include Office suite software coming in, it is no longer acceptable to assume that will be OJT deliverable.					
2. Be proficient at the computer tools and internet applications specific to their line of work.					
3. Competent in Microsoft office suite.					
4. How to specifically navigate government websites.					
5. Use a computer.					
6. Basic computer skills in Word, Excel and Powerpoint.					
7. How to do internet research.					
8. Proficient with Excel, Word, Powerpoint.					
9. Good grasp on understanding how to use GIS tools.					
10. GIS experience a big plus.					
11. Utilize software including GIS, spreadsheets, and databases.					
12. Have working knowledge of GIS platforms, digital photographs, video, work with a variety of specialized field equipment.					

Do you think that a better or more descriptive name for the theme HAVE PROFICIENCY IN COMPUTER APPLICATIONS exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO BE ABLE TO DO to be successful in the field?
___YES ___NO
If YES, what statement(s) would you add?

Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: WORK IN DEMANDING ENVIRONMENTS

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed skills and abilities for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Ability to work in the field, including good mobility and flexibility, enjoy being outdoors, tolerate difficult environmental conditions, access unusual structures, knowledge of basic natural hazards, and have taken comprehensive field safety training.					
2. Ability to work with the changing environmental factors and no two situations will ever be the same.					
3. Have the physical ability to work in extreme weather conditions.					
4. Frequently environmental professionals combine their hobbies with their work – canoeists, hikers, kayakers, hunters, etc.					
5. Must be alert to the open environment since laboratory conditions are rarely encountered.					
6. Need to be willing to spend a great deal of time outdoors.					
7. Have a desire to work outside and do manual work.					
8. Tolerate extreme weather conditions.					

Do you think that a better or more descriptive name for the theme WORK IN DEMANDING ENVIRONMENTS exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO BE ABLE TO DO to be successful in the field?
___YES ___NO
If YES, what statement(s) would you add?

Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: WORK COLLABORATIVELY IN A GROUP ENVIRONMENT

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed skills and abilities for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Be able to work well with a team or on their own.					
2. People with problems working with other people need not apply.					
3. Prove that they are a team player.					
4. Possess a personality that allows you to work well with others.					
5. Work well with compliance personnel in the field.					
6. Participate in strategic planning.					
7. Collaborate and work as a group.					
8. Be a team player and possess ability to work with others to create synergy.					

Do you think that a better or more descriptive name for the theme WORK COLLABORATIVELY IN A GROUP ENVIRONMENT exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO BE ABLE TO DO to be successful in the field?
___YES ___NO
If YES, what statement(s) would you add?

Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: POSSESS A GOOD WORK ETHIC

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed skills and abilities for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Need to demonstrate the ability to be a responsible and motivated employee including get to work on time, follow company policy and guidance.					
2. Possess a good work ethic.					
3. Be at the ready to learn, work, help and be personable.					
4. Self motivation to succeed.					
5. Be prepared to go to work.					

Do you think that a better or more descriptive name for the theme POSSESS A GOOD WORK ETHIC exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO BE ABLE TO DO to be successful in the field?
___YES ___NO
If YES, what statement(s) would you add?

Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: BE PERSUASIVE

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed skills and abilities for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Have the ability to communicate with workers and clients on the situation that needs to be changed.					
2. Successfully argue to merits (sway management) of an environmental program.					
3. Be able to work with people and get buy-in.					
4. Keep the manager informed of environmental issues and encourage them to minimize polluting activities.					
5. Possess ability to explain their concerns about a particular project and be able to explain and suggest several options for completion.					
6. Communication skills to inform and convince upper management of regulatory requirements.					
7. Confident, but not overly confident and persuasive.					

Do you think that a better or more descriptive name for the theme BE PERSUASIVE exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO BE ABLE TO DO to be successful in the field?
___YES ___NO
If YES, what statement(s) would you add?

Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: ABILITY TO THINK CRITICALLY

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed skills and abilities for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Think critically and problem solve.					
2. Know how to handle high stress situations/ emergencies.					
3. Make a decision, defend/debate a point.					
4. Good practical science background in order to problem solve (remediation scenarios, chemical mixtures, etc.).					
5. Make assessments and react to them without delay.					
6. Know what to expect when an inspection occurs and how to handle situations that arise.					
7. Identify areas of non-compliance during a mock audit or inspection.					
8. Skills in critical thinking.					
9. The ability to apply regulations in various situations. At a minimum they should know what regulations apply to their specific field of work.					
10. Read and interpret sections of environmental regulations.					
11. Apply environmental issues to a person's everyday life and understand how does the issue affect the person socially, economically and culturally.					
12. Understand public perception vs. reality.					
13. Have ability and good judgment to see all aspects of the environmental issue, sort through the depth of complexity, and help organize partners and resources to solve environmental problems.					
14. Need to be able to demonstrate competence in both the academic exercise and practical application of field specific technical information and processes.					

Do you think that a better or more descriptive name for the theme ABILITY TO THINK CRITICALLY exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO BE ABLE TO DO to be successful in the field?
___YES ___NO
If YES, what statement(s) would you add?

Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: BE FLEXIBLE

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed skills and abilities for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Multitask.					
2. Keep up with changes in an evolving field.					
3. Have a vision and the drive and willingness to learn something new.					
4. Anyone entering field needs to be flexible and willing to continue learning new issues and technology.					
5. Have an open mind, ready to learn in addition to their academic training.					
6. Keep an open at the ready mind/attitude and if the leadership of that agency/company is similar to your own style, that will help out to become part of the team.					
7. Have an open mind – text book is not always the right way in how things work in the field.					
8. Be willing to obtain new knowledge, skills and abilities.					
9. Be willing to learn and understand that with environmental responsibilities, one is always learning.					
10. Have ability to be continually learning.					
11. Needs to be flexible with schedule and ability to travel freely on short notice.					
12. Be flexible and open to new ideas.					
13. Diversity of skills helps facilitate new career options.					
14. Obtain more training/ education for upward mobility and security.					
15. Keep working and increasing your mastery of those skills with additional training and study.					
16. Be able to adapt to policies and procedures required by employer.					

Do you think that a better or more descriptive name for the theme BE FLEXIBLE exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO BE ABLE TO DO to be successful in the field?
___YES ___NO
If YES, what statement(s) would you add?

Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: RESOURCEFULNESS

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed skills and abilities for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Know when to call for help and bring in a professional.					
2. Know what resources are available to act in a timely manner on implementation.					
3. Ask questions when they don't know how to do something or don't understand.					
4. Possess good organizational and administrative skills.					
5. Where to find information regarding specific environmental issues.					
6. Know how to find the requirements of the various agencies.					
7. Have the ability to assess current compliance areas of concern.					
8. Have the knowledge and skills to research regulations to answer the various concerns for a company.					
9. Should have knowledge of appropriate resources to use and rely on for assistance and legal knowledge updates.					
10. Ability to network with a variety of partners and mobilizing a variety of resources.					
11. What resources are needed to locate standards.					

Do you think that a better or more descriptive name for the theme RESOURCEFULNESS exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO BE ABLE TO DO to be successful in the field?
___YES ___NO
If YES, what statement(s) would you add?

Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: INTEGRITY

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed skills and abilities for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Our company evaluates people on their ability to meet their goals and objectives and gives equal weight to five basic intangibles – external focus, clear thinker, imagination, inclusiveness, and expertise.					
2. Be eager, honest, helpful and freely admit when they don't understand something or should make a mistake.					
3. Possess professional ethics.					
4. Admit when they have made a mistake and take ownership.					
5. Possess integrity, trustworthiness.					
6. Need to demonstrate the ability to put what they know to work in a professional manner.					
7. Possess maturity.					
8. Follow directions.					
9. Character is the most important ingredient in preparing for a career in the environment.					

Do you think that a better or more descriptive name for the theme INTEGRITY exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO BE ABLE TO DO to be successful in the field?
___YES ___NO
If YES, what statement(s) would you add?

Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEME: OUTLIER STATEMENTS

Review each of the following statements associated with this theme. Beside each statement, mark an "X" that corresponds to your opinion of the importance of the statement as needed skills and abilities for an entry-level environmental professional to be successful in the field.

Statement	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
1. Operate instrumentation specific to the environmental profession.					
2. Field equipment operation and maintenance including ATVs, tractors, dozers, fire trucks, pumps and sprayers.					
3. Basic understanding to complete forms including Form Rs, Tier 2s, etc.					
4. Perform environmental assessments to include risk and permitting needs.					
5. Be able to properly fill out permit applications and monthly and annual inventories.					
6. Another skill needed is in data interpretation including statistical analysis of hard numbers from instruments and lab reports.					
7. Be able to generate graphs, tables of data, perform basic statistics and offer general interpretation.					
8. Read and interpret a lab report.					
9. High level of quality assurance (QA) on all data collection and data use activities. Assist with preparation of QA plans, set up sampling programs in accordance with standards, and interpret QA data.					
10. Should know how to conduct audits.					
11. Do phase 1,2,3 cleanup of site.					
12. Be able to perform basic sampling of water, soil and application of basic environmental remediation protocols.					
13. Know there are different EPA laboratory methods and how to look up.					
14. Testing, sampling and remediation protocols for various environmental hazards and safety measures that should be taken in various situations.					
15. Know how to do research.					

Do you think that a better or more descriptive name for the theme OUTLIER STATEMENTS exists? ___ YES ___NO

If YES, what name would you give the theme?

Are there additional supporting statements (sub items) for this theme that entry level environmental professionals NEEDTO BE ABLE TO DO to be successful in the field?
___YES ___NO
If YES, what statement(s) would you add?

Are there supporting statements (sub items) for this theme that need to be eliminated? If yes, which one(s)? Indicate by number.

THEMES – WHAT DOES AN ENTRY-LEVEL ENVIRONMENTAL PROFESSIONAL NEED TO BE ABLE TO DO TO BE SUCCESSFUL IN THE FIELD

Review the list of themes that emerged from the round one questions. Beside each theme, mark an "X" in the box that best represents your opinion of the importance of the theme as needed skills and abilities for an entry-level environmental professional.

THEMES	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
Communicate effectively					
Interpersonal communication					
Write effectively					
Proficiency with computers					
Work in demanding environments					
Work collaboratively					
Possess a good work ethic					
Be persuasive					
Ability to think critically					
Be flexible					
Resourcefulness					
Integrity					
Outlier statements					

SECTION 3
CERTIFICATIONS

CERTIFICATIONS

Review each of the listed certifications. Beside each certification, mark an "X" that corresponds to your opinion of the importance of the certification to an entry-level environmental professional for success in the field.

CERTIFICATIONS	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
EPA Certifications					
Field specific certifications issued by professional societies or national or state certification agencies.					
Specialties depending on the area you are going into.					
Asbestos					
USTs					
Any certification required by employer or law.					
Whatever advanced certification you can obtain.					
Any hands-on class you can acquire.					
Any environmental certification.					
40-Hour HAZWOPR.					
OSHA 30-hour general industry training.					
First-aid basic.					
CPR/AED.					
EMT .					
8-hour basic DOT.					
CHMM.					
PE.					
EIT.					
Certified Geologist.					
Registered Environmental Manager.					
Registered Environmental Professional.					
Certified pool operator and chemical safety for pool chemicals and storage.					
ISO 14000.					
CPA.					
SHEP.					
Law degree.					

Training and certification in software packages.					
Fire training certifications.					
Licenses needed for conducting onsite inspections.					
Certified Professional in Storm Water Quality.					
Certified Professional in Range Management.					
Certified Professional in Soils Correlator.					
Certified Professional in Erosion and Sediment Control.					
Certified Erosion, Sediment and Storm Water Inspector.					
Certified Professional Soils Scientist.					
Registered Land Surveyor.					
Registered Landscape Architect.					
Certified Professional Agronomist.					
CFM.					
CECS.					
Certified Industrial Hygienist.					
Certified Environmental Professional.					
Green certification.					
LEED certification.					

Are certifications necessary for an entry-level environmental professional?

_____ YES _____ NO

If NO, why not? Explain.

SECTION 4
COLLEGE LEVEL COURSES

COLLEGE LEVEL COURSES

Review each of the listed subject areas and courses. Beside each subject area and course, mark an "X" that corresponds to your opinion of the importance of the subject area and accompanying courses to an entry-level environmental professional for success in the field.

SUBJECTS/ COURSES	Unimportant	Little Importance	Moderately Important	Important	Very Important/ Critical
Government					
Basic Government Civics					
Government Function					
Communication					
Public Speaking					
Speech					
Public Relations					
Writing					
Technical Writing					
English Composition					
Occupational Safety					
Industrial Hygiene					
Confined Space Entry					
Personal Protective Equipment					
OSHA Safety Rules and Regulations					
Laboratory Safety					
Hazard Communication					
Toxicology					
Mathematics					
Trigonometry					
Solid Geometry					
Statistics					
Biology					
Biology of Vertebrates					
Biology of Invertebrates					
Taxonomy					
Field Biology					
Wetlands					
Botany					
Wildlife Biology					
Chemistry					
Organic Chemistry					
Chemical Fate and Transport					

Chemistry of Hazardous Materials					
Environmental Chemistry					
Business					
Accounting					
Economics					
Marketing					
Management					
Real Estate					
Science					
Natural Science					
Physical Science					
Basic Sciences					
Ecology					
Geology					
Agricultural Sciences					
Weed Science					
Soil Science					
Range Science					
Limnology					
Hydrology					
Environmental					
Laboratory Classes					
Documentation including chain of custody					
Water Sampling					
Energy					
Energy Management					
Petroleum Land Management					
Risk					
Risk Management					
Risk Analysis					
Risk Assessment					
Regulations					
Air Quality Regulations					
Permits and Regulations					
Regulatory Oversight					
Government – Regulatory Framework for Rulemaking					
State and Federal Regulations and Laws					
Environmental Standards and Regulations					
DOT Regulations on Chemical Transportation					
History of EPA					
Environmental					
Phase I and II Site Assessments					

Sustainability					
Policy					
Safety					
Law					
Politics					
Ethics					
Audits					
Management					
Agriculture					
Range Management					
Forestry					
Soils					
Agronomy					
Agricultural Economics					
Engineering					
Water Supply and Treatment					
Solid Waste Management and Disposal					
Air Pollution					
Agricultural					
Civil					
Principles					
Computers					
Excel					
Word					
Powerpoint					
GIS					
Archaeology					
Adult Education					
Accident Investigation					
Law					
Land Surveying					
Photography					
Planning					
History					
Construction Project Management					
Physics					
Research					
Internship					
Practicum experience in the potential field of employment					
Hazardous Materials and Waste					

Are there any subjects and/or courses that need to be added to this list? _____ YES _____ NO

If YES, add any additional subjects and/or courses below.

This completes the round two ranking exercise. Thank you so much for your diligence in completing this lengthy exercise. Would you please answer the following questions?

1. **What is your job title?**

2. **How long have you worked in the environmental profession?**

   _____ 0-5 years _____ 6-10 years _____ 11-15 years _____16-20 years _____21 + years

3. **Do you consider yourself as working primarily in the private, government, or non-profit sector?**

   _____ Private _____ Government _____ Non-Profit

4. **Do you have any questions or concerns for me regarding the study at this time?**

Appendix K

THEME: THE IMPORTANCE OF HAVING A COLLEGE DEGREE

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q1_One	21	3.00	2.00	5.00	3.3810	.92066
Q1_Two	21	3.00	2.00	5.00	3.9048	.94365
Q1_Three	21	2.00	3.00	5.00	4.0476	.58959
Q1_Four	21	3.00	2.00	5.00	4.0476	.80475
Q1_Five	21	2.00	3.00	5.00	3.8095	.60159
Q1_Six	20	2.00	3.00	5.00	3.9000	.64072
Q1_Seven	21	3.00	2.00	5.00	3.9524	.92066
Q1_Eight	21	3.00	2.00	5.00	3.3810	.86465
Q1_Nine	18	3.00	2.00	5.00	3.6111	.77754
Q1_Ten	21	2.00	2.00	4.00	3.3333	.57735
Q1_Eleven	21	2.00	3.00	5.00	3.5714	.59761
Valid N (listwise)	17					

THEME: VARIETY OF COLLEGE COURSES FOCUSING ON THE SCIENCES

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q2_One	21	2.00	3.00	5.00	4.0476	.86465
Q2_Two	20	2.00	3.00	5.00	4.0000	.91766
Q2_Three	21	2.00	3.00	5.00	4.0000	.83666
Q2_Four	21	3.00	2.00	5.00	3.6190	.86465
Q2_Five	21	4.00	1.00	5.00	2.8571	1.06234
Q2_Six	21	3.00	2.00	5.00	3.0476	.97346
Q2_Seven	21	3.00	2.00	5.00	3.8571	.85356
Q2_Eight	21	2.00	3.00	5.00	4.0952	.76842
Q2_Nine	21	3.00	2.00	5.00	3.1429	.91026
Q2_Ten	21	2.00	3.00	5.00	4.0000	.70711
Q2_Eleven	21	3.00	2.00	5.00	3.4286	.87014
Q2_Twelve	21	3.00	2.00	5.00	3.8095	.87287
Q2_Thirteen	21	2.00	2.00	4.00	3.3333	.73030
Q2_Fourteen	21	3.00	2.00	5.00	2.9524	.86465

Q2_Fifteen	21	3.00	2.00	5.00	3.6667	.96609
Q2_Sixteen	21	3.00	2.00	5.00	3.9048	.88909
Q2_Seventeen	20	3.00	2.00	5.00	3.0000	.91766
Valid N (listwise)	19					

THEME: UNDERSTANDING THE POSITION

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q3_One	20	2.00	3.00	5.00	4.4500	.75915
Q3_Two	20	3.00	2.00	5.00	4.1000	.96791
Q3_Three	19	2.00	3.00	5.00	4.2632	.80568
Q3_Four	20	2.00	3.00	5.00	4.3500	.74516
Q3_Five	20	2.00	3.00	5.00	4.3000	.65695
Q3_Six	20	2.00	3.00	5.00	4.2500	.78640
Q3_Seven	20	2.00	3.00	5.00	4.0500	.60481
Q3_Eight	20	2.00	3.00	5.00	3.8500	.74516
Valid N (listwise)	19					

THEME: BUSINESS ACUMEN

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q4_One	21	2.00	3.00	5.00	4.2381	.76842
Q4_Two	21	3.00	1.00	4.00	2.2381	.62488
Q4_Three	21	3.00	2.00	5.00	3.8571	.79282
Q4_Four	21	3.00	2.00	5.00	3.5238	.81358
Q4_Five	21	3.00	2.00	5.00	3.1429	.79282
Q4_Six	21	3.00	2.00	5.00	3.7619	.83095
Q4_Seven	21	2.00	3.00	5.00	4.4286	.67612
Valid N (listwise)	21					

THEME: PRIVILEGED TO BE PART OF THE FIELD

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q5_One	21	2.00	3.00	5.00	4.4286	.74642
Q5_two	21	4.00	1.00	5.00	3.5714	1.16496
Q5_Three	21	3.00	2.00	5.00	3.2381	.94365
Q5_Four	21	3.00	2.00	5.00	3.7143	1.05560
Q5_Five	21	4.00	1.00	5.00	3.4762	.92839
Q5_Six	21	2.00	3.00	5.00	3.9048	.76842
Q5_Seven	21	3.00	2.00	5.00	3.8095	.81358
Q5_Eight	21	4.00	1.00	5.00	3.2857	1.05560
Q5_Nine	20	1.00	4.00	5.00	4.6000	.50262
Valid N (listwise)	20					

THEME: UNDERSTANDING THE COMPLEX AND INTERRELATED NATURE OF THE FIELD

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q6_One	21	2.00	3.00	5.00	4.3810	.66904
Q6_Two	21	3.00	2.00	5.00	4.0000	.83666
Q6_Three	21	2.00	3.00	5.00	3.6667	.79582
Q6_Four	21	2.00	3.00	5.00	4.2381	.70034
Q6_Five	21	2.00	3.00	5.00	4.2381	.62488
Q6_Six	21	2.00	3.00	5.00	4.5238	.67964
Q6_Seven	21	2.00	3.00	5.00	4.2857	.64365
Valid N (listwise)	21					

THEME: GOVERNMENTAL REGULATORY AGENCIES

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q7_One	21	2.00	3.00	5.00	4.1429	.72703
Q7_Two	21	3.00	2.00	5.00	3.3810	.97346
Q7_Three	20	3.00	2.00	5.00	3.3500	.93330
Q7_Four	21	2.00	3.00	5.00	4.2857	.84515
Q7_Five	21	2.00	3.00	5.00	4.3333	.65828
Q7_Six	21	2.00	3.00	5.00	4.5238	.60159
Valid N (listwise)	20					

THEME: INTERNSHIP/ EXPERIENCES IN THE FIELD

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q8_One	21	1.00	4.00	5.00	4.7143	.46291
Q8_Two	21	2.00	3.00	5.00	4.2857	.71714
Q8_Three	21	2.00	3.00	5.00	4.3333	.65828
Q8_Four	21	3.00	2.00	5.00	3.6667	1.15470
Q8_Five	21	3.00	2.00	5.00	3.4286	1.02817
Q8_Six	21	4.00	1.00	5.00	3.3810	1.02353
Q8_Seven	21	3.00	2.00	5.00	3.3810	.97346
Q8_Eight	21	3.00	2.00	5.00	4.4286	.87014
Q8_Nine	21	4.00	1.00	5.00	3.0476	1.16087
Q8_Ten	21	3.00	2.00	5.00	3.9048	.83095
Q8_Eleven	21	4.00	1.00	5.00	3.5714	1.24786
Valid N (listwise)	21					

THEME: LAWS

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q9_One	21	2.00	3.00	5.00	4.1429	.72703
Q9_Two	21	4.00	1.00	5.00	3.4762	1.07792
Q9_Three	21	2.00	3.00	5.00	4.2857	.71714
Q9_Four	20	2.00	3.00	5.00	4.3000	.73270
Q9_Five	21	2.00	3.00	5.00	4.0952	.83095
Valid N (listwise)	20					

THEME: BROAD/ COMPREHENSIVE GRASP OF ENVIRONMENTAL REGULATIONS

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q10_One	21	3.00	2.00	5.00	4.1429	.85356
Q10_Two	20	3.00	2.00	5.00	4.0500	.94451
Q10_Three	21	3.00	2.00	5.00	3.5238	.92839
Q10_Four	21	3.00	2.00	5.00	4.1905	.87287
Q10_Five	21	4.00	1.00	5.00	4.1905	1.12335
Q10_Six	21	4.00	1.00	5.00	4.0952	.99523
Q10_Seven	21	2.00	3.00	5.00	3.9524	.80475
Q10_Eight	21	3.00	2.00	5.00	3.9048	.88909
Q10_Nine	21	2.00	3.00	5.00	4.2381	.76842
Valid N (listwise)	20					

THEME: OUTLIER STATEMENTS

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q11_One	21	3.00	2.00	5.00	3.6667	.85635
Q11_Two	21	3.00	2.00	5.00	3.8095	.87287
Q11_Three	21	3.00	2.00	5.00	4.0952	.88909
Q11_Four	21	3.00	2.00	5.00	4.5238	.81358
Q11_Five	20	3.00	2.00	5.00	4.1500	.87509
Q11_Six	21	3.00	2.00	5.00	3.8571	.96362
Q11_Seven	21	2.00	3.00	5.00	4.2381	.76842
Q11_Eight	21	3.00	2.00	5.00	4.0952	.83095
Q11_Nine	21	2.00	3.00	5.00	4.1429	.85356
Q11_Ten	21	2.00	3.00	5.00	4.2857	.71714
Valid N (listwise)	20					

THEMES: WHAT DOES AN ENTRY-LEVEL ENVIRONMENTAL PROFESSIONAL NEED TO KNOW TO BE SUCCESSFUL IN THE FIELD

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
College_degree	20	2.00	3.00	5.00	4.5000	.60698
College_courses_sciences	20	2.00	3.00	5.00	4.4500	.75915
Understanding_of_position	21	2.00	3.00	5.00	4.2381	.62488
Business_acumen	21	2.00	3.00	5.00	3.9524	.86465
Privilege_of_work_in_field	21	3.00	2.00	5.00	3.7143	.84515
Understand_complex_and_interrelated_nature_of_field	21	3.00	2.00	5.00	4.0000	.89443
Knowledge_of_regulatory_agencies	21	2.00	3.00	5.00	4.1905	.81358
Internship_experiences	21	2.00	3.00	5.00	4.0476	.74001
Laws	21	3.00	2.00	5.00	3.9524	.92066
Regulations	21	2.00	3.00	5.00	4.2381	.70034
Outlier_statements	19	4.00	1.00	5.00	3.3684	1.06513
Valid N (listwise)	18					

THEME: COMMUNICATE EFFECTIVELY

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q13_One	21	2.00	3.00	5.00	4.7143	.56061
Q13_Two	21	3.00	2.00	5.00	4.4286	.81064
Q13_Three	21	2.00	3.00	5.00	4.5238	.60159
Q13_Four	21	1.00	4.00	5.00	4.8571	.35857
Q13_Five	21	1.00	4.00	5.00	4.5238	.51177
Q13_Six	21	1.00	4.00	5.00	4.6667	.48305
Q13_Seven	21	1.00	4.00	5.00	4.8095	.40237
Q13_Eight	21	1.00	4.00	5.00	4.4762	.51177
Valid N (listwise)	21					

THEME: INTERPERSONAL COMMUNICATION

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q14_One	21	2.00	3.00	5.00	4.0476	.66904
Q14_Two	21	2.00	3.00	5.00	4.4762	.60159
Q14_Three	21	1.00	4.00	5.00	4.4286	.50709
Q14_Four	21	2.00	3.00	5.00	4.5238	.67964
Q14_Five	21	1.00	4.00	5.00	4.4762	.51177
Q14_Six	21	2.00	3.00	5.00	4.4762	.60159
Q14_Seven	21	2.00	3.00	5.00	4.4286	.59761
Q14_Eight	21	2.00	3.00	5.00	4.3810	.58959
Q14_Nine	21	2.00	3.00	5.00	4.4286	.67612
Q14_Ten	21	2.00	3.00	5.00	4.2381	.70034
Q14_Eleven	21	2.00	3.00	5.00	4.3810	.58959
Q14_Twelve	21	2.00	3.00	5.00	4.1905	.51177
Q14_Thirteen	21	2.00	3.00	5.00	4.4762	.67964
Valid N (listwise)	21					

THEME: WRITE EFFECTIVELY

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q15_One	20	2.00	3.00	5.00	4.7000	.57124
Q15_Two	20	1.00	4.00	5.00	4.8500	.36635
Q15_Three	20	2.00	3.00	5.00	4.4000	.75394
Q15_Four	20	2.00	3.00	5.00	4.3000	.65695
Q15_Five	20	2.00	3.00	5.00	4.3500	.67082
Q15_Six	20	2.00	3.00	5.00	4.5000	.60698
Q15_Seven	20	2.00	3.00	5.00	4.5500	.60481
Q15_Eight	19	3.00	2.00	5.00	4.0000	.88192
Q15_Nine	20	2.00	3.00	5.00	4.7000	.57124
Q15_Ten	20	3.00	2.00	5.00	4.1500	.87509
Q15_Eleven	20	2.00	3.00	5.00	4.4500	.68633
Q15_Twelve	20	2.00	3.00	5.00	4.6500	.58714
Q15_Thirteen	20	2.00	3.00	5.00	4.5000	.60698
Valid N (listwise)	19					

THEME: HAVE PROFICIENCY IN COMPUTER APPLICATIONS

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q16_One	21	2.00	3.00	5.00	4.2857	.64365
Q16_Two	21	1.00	4.00	5.00	4.6190	.49761
Q16_Three	21	2.00	3.00	5.00	4.5714	.59761
Q16_Four	21	2.00	3.00	5.00	4.2381	.62488
Q16_Five	21	1.00	4.00	5.00	4.9048	.30079
Q16_Six	21	2.00	3.00	5.00	4.7619	.53896
Q16_Seven	21	2.00	3.00	5.00	4.5238	.60159
Q16_Eight	21	2.00	3.00	5.00	4.4762	.67964
Q16_Nine	21	2.00	3.00	5.00	3.8095	.60159
Q16_Ten	21	3.00	2.00	5.00	3.7619	.76842
Q16_Eleven	21	3.00	2.00	5.00	3.7619	.76842
Q16_Twelve	21	3.00	2.00	5.00	3.9048	.70034
Valid N (listwise)	21					

THEME: WORK IN DEMANDING ENVIRONMENTS

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q17_One	21	2.00	3.00	5.00	4.2857	.71714
Q17_Two	21	2.00	3.00	5.00	4.1905	.67964
Q17_Three	21	2.00	3.00	5.00	3.9524	.74001
Q17_Four	20	4.00	1.00	5.00	2.7500	1.06992
Q17_Five	21	3.00	2.00	5.00	3.6667	1.01653
Q17_Six	21	3.00	2.00	5.00	3.8095	.92839
Q17_Seven	21	3.00	2.00	5.00	3.7143	.95618
Q17_Eight	21	3.00	2.00	5.00	3.6190	.97346
Valid N (listwise)	20					

THEME: WORK COLLABORATIVELY IN A GROUP ENVIRONMENT

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q18_One	21	2.00	3.00	5.00	4.6190	.58959
Q18_Two	21	3.00	2.00	5.00	3.8095	.98077
Q18_Three	21	2.00	3.00	5.00	4.3333	.65828
Q18_Four	21	2.00	3.00	5.00	4.5238	.60159
Q18_Five	21	1.00	4.00	5.00	4.3810	.49761
Q18_Six	21	3.00	2.00	5.00	3.8095	.87287
Q18_Seven	20	2.00	3.00	5.00	4.3000	.65695
Q18_Eight	20	2.00	3.00	5.00	4.5000	.76089
Valid N (listwise)	20					

THEME: POSSESS A GOOD WORK ETHIC

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q19_One	21	1.00	4.00	5.00	4.8095	.40237
Q19_Two	21	1.00	4.00	5.00	4.9048	.30079
Q19_Three	21	1.00	4.00	5.00	4.8571	.35857
Q19_Four	21	2.00	3.00	5.00	4.8095	.51177
Q19_Five	21	1.00	4.00	5.00	4.7619	.43644
Valid N (listwise)	21					

THEME: BE PERSUASIVE

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q20_One	21	2.00	3.00	5.00	4.2857	.64365
Q20_Two	21	3.00	2.00	5.00	3.9524	.80475
Q20_Three	21	3.00	2.00	5.00	4.2381	.70034
Q20_Four	21	2.00	3.00	5.00	4.4762	.67964
Q20_Five	21	2.00	3.00	5.00	4.4762	.67964
Q20_Six	21	2.00	3.00	5.00	4.4762	.67964
Q20_Seven	21	3.00	2.00	5.00	4.1429	.79282
Valid N (listwise)	21					

THEME: ABILITY TO THINK CRITICALLY

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q21_One	21	1.00	4.00	5.00	4.7143	.46291
Q21_Two	21	2.00	3.00	5.00	4.3810	.66904
Q21_Three	21	2.00	3.00	5.00	4.2857	.64365
Q21_Four	21	2.00	3.00	5.00	4.3810	.74001
Q21_Five	21	2.00	3.00	5.00	4.0952	.62488
Q21_Six	21	2.00	3.00	5.00	4.1905	.74960
Q21_Seven	21	3.00	2.00	5.00	4.2381	.88909
Q21_Eight	21	2.00	3.00	5.00	4.4762	.60159
Q21_Nine	21	2.00	3.00	5.00	4.4286	.67612
Q21_Ten	21	3.00	2.00	5.00	4.2857	.78376
Q21_Eleven	20	3.00	2.00	5.00	3.6500	.87509
Q21_Twelve	21	3.00	2.00	5.00	4.0952	.83095
Q21_Thirteen	21	3.00	2.00	5.00	4.0476	.66904
Q21_Fourteen	20	3.00	2.00	5.00	4.1000	.85224
Valid N (listwise)	19					

THEME: BE FLEXIBLE

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q22_One	21	3.00	2.00	5.00	4.0952	.76842
Q22_Two	21	1.00	4.00	5.00	4.5238	.51177
Q22_Three	21	2.00	3.00	5.00	4.3333	.65828
Q22_Four	21	1.00	4.00	5.00	4.4762	.51177
Q22_Five	21	2.00	3.00	5.00	4.5238	.60159
Q22_Six	21	2.00	3.00	5.00	4.1905	.74960
Q22_Seven	21	2.00	3.00	5.00	4.4286	.59761
Q22_Eight	21	1.00	4.00	5.00	4.7143	.46291
Q22_Nine	21	2.00	3.00	5.00	4.3333	.73030
Q22_Ten	21	1.00	4.00	5.00	4.5238	.51177
Q22_Eleven	21	3.00	2.00	5.00	4.0000	.77460
Q22_Twelve	21	1.00	4.00	5.00	4.5714	.50709
Q22_Thirteen	21	3.00	2.00	5.00	4.1429	.79282
Q22_Fourteen	21	2.00	3.00	5.00	4.2381	.62488
Q22_Fifteen	21	2.00	3.00	5.00	4.3333	.65828
Q22_Sixteen	21	2.00	3.00	5.00	4.4286	.67612
Valid N (listwise)	21					

THEME: RESOURCEFULNESS

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q23_One	21	2.00	3.00	5.00	4.4762	.60159
Q23_Two	21	2.00	3.00	5.00	4.3810	.58959
Q23_Three	21	1.00	4.00	5.00	4.7143	.46291
Q23_Four	21	2.00	3.00	5.00	4.1429	.57321
Q23_Five	21	3.00	2.00	5.00	4.3810	.80475
Q23_Six	20	2.00	3.00	5.00	4.3000	.57124
Q23_Seven	21	2.00	3.00	5.00	4.3333	.57735
Q23_Eight	21	2.00	3.00	5.00	4.3810	.58959
Q23_Nine	21	2.00	3.00	5.00	4.2381	.53896
Q23_Ten	21	2.00	3.00	5.00	4.0000	.63246
Q23_Eleven	20	2.00	3.00	5.00	4.1500	.58714

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q23_One	21	2.00	3.00	5.00	4.4762	.60159
Q23_Two	21	2.00	3.00	5.00	4.3810	.58959
Q23_Three	21	1.00	4.00	5.00	4.7143	.46291
Q23_Four	21	2.00	3.00	5.00	4.1429	.57321
Q23_Five	21	3.00	2.00	5.00	4.3810	.80475
Q23_Six	20	2.00	3.00	5.00	4.3000	.57124
Q23_Seven	21	2.00	3.00	5.00	4.3333	.57735
Q23_Eight	21	2.00	3.00	5.00	4.3810	.58959
Q23_Nine	21	2.00	3.00	5.00	4.2381	.53896
Q23_Ten	21	2.00	3.00	5.00	4.0000	.63246
Q23_Eleven	20	2.00	3.00	5.00	4.1500	.58714
Valid N (listwise)	19					

THEME: INTEGRITY

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q24_One	20	3.00	2.00	5.00	3.9500	.68633
Q24_Two	20	1.00	4.00	5.00	4.7000	.47016
Q24_Three	21	1.00	4.00	5.00	4.8571	.35857
Q24_Four	21	1.00	4.00	5.00	4.7143	.46291
Q24_Five	21	1.00	4.00	5.00	4.8095	.40237
Q24_Six	21	1.00	4.00	5.00	4.6190	.49761
Q24_Seven	21	2.00	3.00	5.00	4.5238	.60159
Q24_Eight	21	2.00	3.00	5.00	4.6190	.58959
Q24_Nine	21	4.00	1.00	5.00	4.4286	.97834
Valid N (listwise)	19					

THEME: OUTLIER STATEMENTS

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Q25_One	20	3.00	2.00	5.00	3.8000	.83351
Q25_Two	20	2.00	2.00	4.00	2.9000	.55251
Q25_Three	20	3.00	2.00	5.00	3.5000	.82717
Q25_Four	20	3.00	2.00	5.00	3.6500	.87509
Q25_Five	19	3.00	2.00	5.00	3.5263	.69669
Q25_Six	20	2.00	3.00	5.00	3.7500	.63867
Q25_Seven	20	2.00	3.00	5.00	4.0000	.64889
Q25_Eight	20	2.00	3.00	5.00	4.0000	.72548
Q25_Nine	19	2.00	3.00	5.00	4.0000	.74536
Q25_Ten	20	3.00	2.00	5.00	3.6000	.82078
Q25_Eleven	20	3.00	2.00	5.00	3.3000	1.08094
Q25_Twelve	20	3.00	2.00	5.00	3.8500	.81273
Q25_Thirteen	19	3.00	2.00	5.00	3.7895	.85498
Q25_Fourteen	20	3.00	2.00	5.00	3.7000	.80131
Q25_Fifteen	19	2.00	3.00	5.00	4.3684	.76089
Valid N (listwise)	17					

THEMES: WHAT DOES AN ENTRY-LEVEL ENVIRONMENTAL PROFESSIONAL NEED TO BE ABLE TO DO TO BE SUCCESSFUL IN THE FIELD

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Communicate_effectively	21	1.00	4.00	5.00	4.7619	.43644
Interpersonal_communication	21	1.00	4.00	5.00	4.6190	.49761
Write_effectively	21	1.00	4.00	5.00	4.5714	.50709
Proficiency_with_computers	21	2.00	3.00	5.00	4.4286	.59761
Work_in_demanding_environments	21	3.00	2.00	5.00	3.7619	.70034
Work_collaboratively	21	2.00	3.00	5.00	4.4286	.59761
Possess_a_good_work_ethic	21	1.00	4.00	5.00	4.6667	.48305
Be_persuasive	21	2.00	3.00	5.00	4.0476	.58959
Ability_to_think_critically	20	1.00	4.00	5.00	4.5000	.51299
Be_flexible	21	2.00	3.00	5.00	4.2857	.71714
Resourcefulness	21	1.00	4.00	5.00	4.5238	.51177
Integrity	21	1.00	4.00	5.00	4.8571	.35857
Outlier_statements2	12	3.00	2.00	5.00	4.0000	.85280
Valid N (listwise)	11					

CERTIFICATIONS

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
EPA_Certifications	19	3.00	2.00	5.00	3.1579	.95819
Field_specific_certifications	20	3.00	2.00	5.00	3.4500	.82558
Specialties_on_area	19	2.00	3.00	5.00	3.7895	.63060
Asbestos	20	3.00	2.00	5.00	2.7000	.92338
USTs	20	2.00	2.00	4.00	2.7500	.71635
Required_by_employer_or_law	19	3.00	2.00	5.00	4.1053	1.10024
Advanced_certifications	20	4.00	1.00	5.00	3.2500	.91047
Hands_on_class	20	4.00	1.00	5.00	3.8000	1.15166
Environmental_certifications	20	4.00	1.00	5.00	3.4000	1.09545
HAZWOPR	20	2.00	3.00	5.00	4.1000	.91191
OSHA	20	3.00	2.00	5.00	3.4000	.82078
First_aid	21	3.00	2.00	5.00	3.8571	1.01419
CPR_AED	20	4.00	1.00	5.00	3.4000	1.31389
EMT	19	3.00	1.00	4.00	2.2105	.85498
DOT	20	3.00	1.00	4.00	2.8500	.87509
CHMM	20	4.00	1.00	5.00	3.0000	1.02598
PE	20	4.00	1.00	5.00	2.9000	1.33377
EIT	20	4.00	1.00	5.00	2.9000	1.07115
Certified_Geologist	20	4.00	1.00	5.00	2.6500	1.18210
Environmental_Manager	20	4.00	1.00	5.00	2.7500	1.11803
Environmental_Professional	20	4.00	1.00	5.00	2.9000	1.02084
Pool_operator_and_chemical	20	3.00	1.00	4.00	2.0000	.91766
ISO_14000	18	3.00	1.00	4.00	2.3889	.77754
CPA	21	4.00	1.00	5.00	2.0000	1.14018
SHEP	17	4.00	1.00	5.00	2.2353	1.09141
Law_degree	21	2.00	1.00	3.00	1.8095	.74960
Certification_software_packages	20	3.00	1.00	4.00	2.7000	.97872
Fire_training_certification	19	3.00	1.00	4.00	2.2105	.97633
Licenses_onsite_inspections	20	4.00	1.00	5.00	3.1500	1.26803
Storm_Water_Quality	20	4.00	1.00	5.00	2.5500	1.05006
Range_management	20	3.00	1.00	4.00	2.1500	.81273

Soils_correlator	20	3.00	1.00	4.00	2.1500	.81273
Erosion_and_sediment_control	20	3.00	1.00	4.00	2.5000	.88852
Erosion_sediment_and_storm_water_inspector	20	3.00	1.00	4.00	2.3500	.93330
Soils_scientist	20	3.00	1.00	4.00	2.1500	.81273
Land_Surveyor	20	4.00	1.00	5.00	2.2500	.96655
Landscape_architect	20	4.00	1.00	5.00	1.9500	.99868
Professional_agronomist	19	2.00	1.00	3.00	1.8421	.68825
CFM	18	4.00	1.00	5.00	2.1667	1.09813
CECS	18	3.00	1.00	4.00	1.8889	.75840
Industrial_Hygienist	20	4.00	1.00	5.00	2.6000	1.14248
Certified_Environmental_Professional	20	4.00	1.00	5.00	2.7000	1.03110
Green_certification	20	4.00	1.00	5.00	2.1500	.93330
LEED	19	4.00	1.00	5.00	2.3158	1.05686
Valid N (listwise)	12					

COLLEGE LEVEL COURSES

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Government1	12	2.00	2.00	4.00	3.2500	.62158
Basic_Government_Civics2	21	3.00	2.00	5.00	3.0476	.92066
Government_function3	16	3.00	2.00	5.00	3.0625	.92871
Communication4	9	3.00	2.00	5.00	4.1111	.92796
Public_speaking5	20	3.00	2.00	5.00	3.8500	.98809
Speech6	20	3.00	2.00	5.00	3.9000	1.07115
Public_relations7	20	3.00	2.00	5.00	3.5500	1.05006
Writing8	20	3.00	2.00	5.00	4.3500	.74516
Technical_writing9	20	3.00	2.00	5.00	4.2000	.83351
English_composition10	19	3.00	2.00	5.00	4.1053	.73747
Occupational_safety11	10	2.00	3.00	5.00	3.9000	.73786
Industrial_hygiene12	20	2.00	3.00	5.00	4.0000	.85840
Confined_space_entry13	20	3.00	2.00	5.00	3.7500	.91047
Personal_protective_equipment14	20	2.00	3.00	5.00	4.1500	.81273
OSHA_safety_rules_and_Reg15	20	2.00	3.00	5.00	4.3000	.80131
Laboratory_safety16	20	2.00	3.00	5.00	4.1000	.85224
Hazard_communication17	20	2.00	3.00	5.00	4.3000	.73270
Toxicology18	17	2.00	3.00	5.00	3.8824	.92752
Mathmatics19	8	3.00	2.00	5.00	3.8750	.99103
Trigonometry20	21	4.00	1.00	5.00	3.3810	1.02353
Solid_geometry21	20	4.00	1.00	5.00	3.4000	.99472
Statistics22	20	4.00	1.00	5.00	3.7500	1.06992
Biology23	7	2.00	3.00	5.00	3.8571	.69007
Biology_of_Vertebrates24	21	4.00	1.00	5.00	3.2381	.99523
Biology_of_Invertebrates25	20	3.00	1.00	4.00	3.2000	.95145
Taxonomy26	21	3.00	1.00	4.00	3.0000	.89443
Field_biology27	21	4.00	1.00	5.00	3.5238	1.03049
Wetlands28	21	4.00	1.00	5.00	3.4762	.98077
Botany29	21	4.00	1.00	5.00	3.3810	1.02353
Wildlife_Biology30	21	4.00	1.00	5.00	3.2857	1.00712
Chemistry31	4	2.00	3.00	5.00	4.0000	.81650

Organic_chemistry32	21	2.00	3.00	5.00	3.9048	.70034
Chemical_fate_and_transport 33	21	4.00	1.00	5.00	3.7619	.99523
Chemistry_of_hazardous_ma terials34	21	3.00	2.00	5.00	4.0000	.94868
Environmental_chemistry35	21	3.00	2.00	5.00	4.0952	.94365
Business36	4	1.00	3.00	4.00	3.5000	.57735
Accounting37	20	4.00	1.00	5.00	2.7500	.96655
Econoics38	21	4.00	1.00	5.00	2.8571	.91026
Marketing39	21	4.00	1.00	5.00	2.7619	1.09109
Management40	21	3.00	2.00	5.00	3.3810	.97346
Real_Estate41	21	3.00	1.00	4.00	2.2381	.83095
Science42	5	1.00	4.00	5.00	4.6000	.54772
Natural_Science43	21	3.00	2.00	5.00	3.8571	.79282
Physical_science44	21	3.00	2.00	5.00	3.8095	.92839
Basic_science45	21	3.00	2.00	5.00	4.0476	.86465
Ecology46	21	4.00	1.00	5.00	3.6667	1.06458
Geology47	21	4.00	1.00	5.00	3.6190	1.11697
Agricultural_science48	21	3.00	2.00	5.00	3.3810	.97346
Weed_science49	20	3.00	1.00	4.00	2.9000	.91191
Soil_science50	21	3.00	2.00	5.00	3.3810	.80475
Range_science51	20	2.00	2.00	4.00	3.0500	.82558
Limnology52	20	4.00	1.00	5.00	3.3000	1.03110
Hydrology53	19	4.00	1.00	5.00	3.8947	.99413
Environmental54	21	2.00	3.00	5.00	4.2381	.70034
Laboratory_classes55	8	2.00	3.00	5.00	4.1250	.64087
Documentations_including_c hain_of_custody56	21	2.00	3.00	5.00	4.0952	.62488
Water_sampling57	20	2.00	3.00	5.00	3.9500	.60481
Energy58	6	2.00	3.00	5.00	3.8333	.75277
Energy_management59	20	2.00	2.00	4.00	3.3000	.86450
Petroleum_land_managemen t60	19	2.00	2.00	4.00	3.2632	.73349
Risk61	7	1.00	4.00	5.00	4.7143	.48795
Risk_management62	21	2.00	3.00	5.00	4.0476	.80475
Risk_analysis63	21	2.00	3.00	5.00	4.0952	.76842
Risk_assessment64	19	2.00	3.00	5.00	4.1053	.80930

Regulations65	7	1.00	4.00	5.00	4.7143	.48795
Air_Quality_Regulations66	20	2.00	3.00	5.00	4.1500	.74516
Permits_and_regulations67	20	2.00	3.00	5.00	4.2000	.61559
Regulatory_Oversight68	20	2.00	3.00	5.00	4.1000	.71818
Government_Regulatory_Framework_for_Rulmaking69	21	3.00	2.00	5.00	3.9048	.88909
State_Federal_Regulations_and_laws70	21	2.00	3.00	5.00	4.2381	.70034
Environmental_standards_and_regulations71	21	2.00	3.00	5.00	4.2381	.62488
DOT_Regulations_on_Chemical_Transportation72	19	2.00	3.00	5.00	3.9474	.77986
History_of_EPA73	19	3.00	2.00	5.00	3.3158	1.20428
Environmental74	7	2.00	3.00	5.00	4.5714	.78680
Phase_1_and_2_site_assessments75	20	3.00	2.00	5.00	4.1000	.91191
Sustainability76	20	3.00	2.00	5.00	3.7500	.91047
Policy77	20	3.00	2.00	5.00	3.8000	.89443
Safety78	20	2.00	3.00	5.00	4.2500	.63867
Laws79	20	3.00	2.00	5.00	3.7000	.92338
Politics80	21	4.00	1.00	5.00	3.2857	.90238
Ethics81	20	3.00	2.00	5.00	3.9000	.85224
Audits82	20	2.00	3.00	5.00	3.8000	.61559
Management83	20	2.00	3.00	5.00	3.9500	.68633
Agriculture84	5	2.00	2.00	4.00	2.6000	.89443
Range_management85	18	2.00	2.00	4.00	2.7222	.75190
Forestry86	19	2.00	2.00	4.00	2.7368	.80568
Soils87	21	3.00	2.00	5.00	3.0952	.94365
Agronomy88	19	2.00	2.00	4.00	2.7368	.80568
Agricultural_economics89	19	2.00	2.00	4.00	2.7895	.85498
Engineering90	7	2.00	3.00	5.00	4.1429	.69007
Water_supply_and_treatment91	20	2.00	3.00	5.00	3.8000	.69585
Solid_waste_management_and_disposal92	20	2.00	3.00	5.00	3.9000	.71818
Air_pollution93	20	2.00	3.00	5.00	4.0000	.72548
Agricultural94	20	3.00	2.00	5.00	3.1000	.96791
Civil95	20	4.00	1.00	5.00	3.3000	1.12858

Principles96	20	3.00	2.00	5.00	3.4000	1.09545
Computers97	4	1.00	4.00	5.00	4.5000	.57735
Excel98	21	3.00	2.00	5.00	4.1905	.87287
Word99	21	3.00	2.00	5.00	4.2857	.84515
Powerpoint100	21	3.00	2.00	5.00	4.1905	.92839
GIS101	21	3.00	2.00	5.00	3.7143	.78376
Archaelogy102	19	3.00	1.00	4.00	2.5263	.90483
Adult_Eduations103	21	4.00	1.00	5.00	2.9524	1.02353
Accident_Investigation104	20	4.00	1.00	5.00	3.0000	1.07606
Law105	20	4.00	1.00	5.00	3.0500	1.19097
Land_surveying106	20	2.00	2.00	4.00	2.6000	.68056
Photography107	20	3.00	1.00	4.00	2.5000	.94591
Planning108	20	4.00	1.00	5.00	3.3500	.98809
History109	20	3.00	1.00	4.00	2.8000	1.10501
Construction_project_maneg ement110	20	3.00	2.00	5.00	3.2500	.78640
Physics111	20	4.00	1.00	5.00	3.2500	1.11803
Research112	20	3.00	2.00	5.00	3.7000	.80131
Internship113	19	2.00	3.00	5.00	4.2632	.65338
Practicum_experiences114	21	2.00	3.00	5.00	4.3810	.66904
Hazardous_materials_and_w aste115	21	2.00	3.00	5.00	4.2857	.84515
Valid N (listwise)	2					

VITA

Robin Hood Lacy, Jr.

Candidate for the Degree of

Doctor of Philosophy

Dissertation: EMPLOYER EXPECTATIONS FOR ENTRY TO THE ENVIRONMENTAL PROFESSION: NECESSARY KNOWLEDGE, SKILLS AND ABILITIES

Major Field: Environmental Science

Biographical:

Education:
Completed the requirements for Bachelor of Science in Business Administration/ Marketing and Management at Oklahoma State University, Stillwater, Oklahoma in December, 1985.

Completed the requirements for Master of Science in Environmental Science at Oklahoma State University, Stillwater, Oklahoma in May, 1998.

Completed the requirements for Doctor of Philosophy in Environmental Science at Oklahoma State University, Stillwater, Oklahoma in July, 2011.

Experience:
Environmental Scientist at C.H. Guernsey and Company: 1993-1999.

Instructor of Industrial Safety at the University of Central Oklahoma: 1999-present.

Department Chair – Occupational and Technology Education: 2005-2008.

Professional Memberships:
National Safety Council

Oklahoma Safety Council

Name: Robin Hood Lacy, Jr. Date of Degree: July, 2011

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: EMPLOYER EXPECTATIONS FOR ENTRY TO THE ENVIRONMENTAL PROFESSION: NECESSARY KNOWLEDGE, SKILLS AND ABILITIES

Pages in Study: 200 Candidate for the Degree of Doctor of Philosophy

Major Field: Environmental Science

Scope and Method of Study:

This study was designed to elicit employer expectations for entry-level environmental professionals. Thirty-three experts from the environmental profession representing the private, government and non-profit employment sectors participated in a two-round Delphi study consisting initially of open-ended questions concerning knowledge, skills and abilities, followed by a Likert-scale rating exercise generated from the qualitative responses in round one. The expert's importance ratings to determinant themes and supporting statements emerging from the round one questions were analyzed through the use of SPSS 17.0 for mean and standard deviation resulting in categories of initial agreement, initial disagreement, and initial resolution of high importance.

Findings and Conclusions:

Experts participating in the two round Delphi study rated themes and supporting statements for importance by the use of a five point Likert-scale. The themes equated to questions posed to the experts: what does an entry-level environmental professional need to know to be successful in the field; need to be able to do to be successful in the field; what certifications are most important, and what college-level courses are most important. The resulting data were compiled and analyzed for initial agreement, initial disagreement, and initial resolution of high importance. The end result of the research produced primary competencies for entry-level environmental professionals including integrity, effective communication skills, strong work ethic, effective interpersonal communication skills, writing effectively, resourcefulness, critical thinking, and coursework in college including science, risk, regulations and computers. It is hoped that this study will serve to clarify the expectations of employers regarding necessary knowledge, skills and abilities for entry-level environmental professionals, and that stakeholders including students, graduates, faculty, curriculum coordinators, career placement officers, and said employers will work together to produce environmental professionals that are qualified to make immediate, effective and enduring impacts on the industry.

ADVISER'S APPROVAL: Dr. Lowell Caneday