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Assessing supply, demand, and professional development needs of employees in water-related careers

by

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B.S., Kansas State University, 2015

A THESIS

submitted in partial fulfillment of the requirements for the degree

MASTER OF SCIENCE

Department of Communications and Agricultural Education
College of Agriculture

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2017

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Abstract

STEM fields represent between 5% and 20% of all employed in the United States (United States Department of Labor – Bureau of Labor Statistics, 2015). Many employers of job positions in the STEM field have indicated an ongoing challenge of demand for such employees exceeding supply (Hira, 2010). Literature suggests a skills gap exists in some career fields and labor markets (Sentz, 2013). A topic that falls in many STEM fields in water resources. In Kansas, both supply and demand of water resources vary greatly across the state. A growing trend statewide, however, is a need to focus efforts on preserving the quality and quantity of Kansas' water supply. Anecdotal evidence suggests the focus on water resources increases the demand for employees prepared for careers in related STEM fields (S. Metzger, personal communication, May 3, 2016). Drawing on both the Human Capital Theory and the Theory of Work Adjustment, descriptive survey research and qualitative interviews based in symbolic interactionism were used to gather data from employers of water-related job positions. The data indicated that a variety of employability and technical skills describe both employers' ability requirements and employees' ability sets. The results of the study suggest that, while employers have not recently experienced much challenge filling job vacancies, demand for employees could increase in the near future. Additionally, employers utilize a variety of professional development resources, and would utilize others if available. While levels of correspondence range among ability requirements and ability sets depending on the job position, efforts in education and recruitment could help address the supply of candidates for these positions.

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Acknowledgements

There are many to whom I owe gratitude for showing me unending support, challenging me to think harder, and equipping me with knowledge and experiences that have enriched my graduate program. First, thank you to my major professor, Dr. Shannon Washburn. You epitomize the type of educator I can only aspire to be someday, and your commitment to the development of students and educators is unmatched. Thank you for your mentorship, patience, guidance and occasional water pun throughout this process.

Second, thank you to my committee members – Dr. Kris Boone, Dr. Jon Ulmer, Dr. Stacy Hutchinson and Dr. Royce Ann Collins. I am so grateful for each of you, and am appreciative of the wealth of knowledge you brought to this study and shared willingly with me.

Third, I want to express my gratitude to Susan Metzger, as well as the entire Water Vision Team from the Kansas Department of Agriculture and Kansas Water Office. Susan, I cannot thank you enough for the role you so willingly played in this study. Thank you for investing your time and expertise throughout the design and data collection process. To the team, thank you for sparking my interest in this topic in the first place. I admire each of you for the work you do.

Chapter 1 - Introduction

Chapter Overview

This thesis is a report of a mixed methods study of professional development needs for employees in water-related careers. The study was based on a survey and a set of qualitative interviews of individuals in hiring positions in organizations with water-related positions. The first chapter of the thesis includes a background of the study, focused on professional development trends and the state of water resources in Kansas. The chapter then describes the problem of the study and its significance to the field of education, outlines the research purpose and questions, provides an overview of the methodology, acknowledges limitations of the study and defines key terms.

Background

STEM workforce

The portion of the United States workforce focusing on science, technology, engineering and math (STEM) fields ranges in reported size, depending on the way in which it is defined. Overall, STEM fields represent between 5% and 20% of all employed in the United States (United States Department of Labor – Bureau of Labor Statistics [BLS], 2015). Many policymakers, as well as academic and business leaders, believe the STEM workforce has a "disproportionally high impact on the nation" (Hira, 2010, p. 950). These fields affect the nation's standard of living, national security and level of innovation, particularly related to solving the most current societal challenges (Hira, 2010, & Department for Professional Employees AFL-CIO [DPE], 2016).

STEM professionals enter their respective fields from a variety of educational and training backgrounds, depending on the required skills for the specified areas of work (DPE,

2016). The U.S. Census Bureau (as cited in DPE, 2016) reported high education attainment in the first quarter of 2016 for STEM professionals, particularly for life, physical and social scientists earning at least a bachelor's degree, as well as engineers earning at least an associate's degree. The same report indicated lower education attainment for those in technical occupations, as the skills required in such positions demand. Even so, most technical employees had completed education beyond a high school diploma, with 50% earning at least an associate's degree (DPE, 2016).

Economic projections provided by the President's Council of Advisors on Science and Technology [PCAST] (2012) indicated a high need for STEM professionals if the United States is to maintain global leadership in science and technology. The report suggested the current rate of increase in STEM professionals in the U.S. workforce needs to grow to produce approximately one million more STEM professionals over the succeeding decade (PCAST, 2012). Employers for technology-related job positions, too, have indicated an ongoing challenge of demand for such employees exceeding supply (Hira, 2010).

State of water resources in Kansas

Geographical overview

The water system in Kansas is predominantly characterized by differences from the west to the east. These differences are not only hydrological but are also driven by differing economic impacts of water use as well as a diverse philosophical approach of those using the water. Western Kansas receives most of its water supply from groundwater sources, while eastern Kansas is supplied primarily by surface water. The state of Kansas overlays a portion of the High Plains Aquifer, one of the world's largest aquifers supplying water to approximately 27% of the irrigated cropland in the United States. A portion of the High Plains Aquifer, called the Ogallala

Aquifer, underlies much of western Kansas and serves as the primary source of water for all uses in that area. Due to heavy development and over-appropriation of the aquifer in the last 60 years, both water quantity and quality are deteriorating. The Ogallala portion of the High Plains Aquifer is not the only groundwater source in Kansas. The Great Bend Prairie and Equus Beds aquifers underlie areas of south central Kansas (Buchanan, Wilson, Buddemeier & Butler, 2015).

Surface water in the state is predominantly available in rivers and streams, with few natural lakes. Many reservoirs have been constructed in Kansas to control flooding and store water for beneficial use, but these reservoirs face challenges including the loss of storage space due to sedimentation, the costs associated with operation and maintenance of the reservoirs, and the appropriate water release schedule from the Kansas River by the United States Army Corps of Engineers (Kansas State University [KSU], 2008).

The rate of population growth in areas of high demand for municipal water use in Kansas suggests an increased reliance on reservoirs to supply water. Kansas has purchased storage in 14 federal reservoirs to increase accessibility of water for municipal, industrial and irrigation uses. Nearly 60% of the energy produced as well as approximately two-thirds of the citizens in Kansas rely on the water supplied by reservoirs. This, too, presents a challenge, as the state must identify additional methods to pay for supplementary storage (Kansas Water Office [KWO], 2010).

Weather and climate are both highly variable in Kansas from daily, yearly and multi-yearly perspectives. This is exemplified by the periodic recurrence of drought conditions in Kansas, which have been an ongoing challenge in the state in recent years (Streeter et al., 2015). At the end of 2014, 79 Kansas counties were classified as primary disaster areas due to drought, and 13 counties were classified as contiguous disaster areas due to drought, according to the U.S. Department of Agriculture. At the state level, Kansas Governor Sam Brownback issued

Executive Order 14-04 in 2014, issuing a Drought Emergency warning to 56 counties, drought warning in 26 counties, and a watch to an additional 23 counties. At the end of May 2015, the U.S. Drought Monitor suggested dry conditions continued to persist across 33% of Kansas, prompting the continuance of a Drought Warning to 29 counties (Knowles, 2015).

Regardless of climate conditions, Kansans have a need for a quality water supply, using approximately four million acre-feet of water each year. Statewide, irrigation accounts for 80 to 85% of all water diverted in most years. Municipal use is the second largest water user. From there, water use in Kansas can best be described from the eastern and western sides of the state. While there are aquifers in eastern Kansas, they yield much less water than those in the west (Streeter et al., 2015). Eastern Kansas receives most of its water from surface water sources. However, the reservoirs that store the state's surface water supply are filling with sediment. Projections indicate the reservoirs will be 40% filled with sediment if no action is taken in the next 50 years. Additionally, five of the seven major river basins will not have the capacity to meet the demands of municipal and industrial use during a drought (Metzger, 2014).

In western Kansas, the climate conditions, notably a multi-year drought, have an adverse and unreliable effect on the surface water supply. Therefore, western Kansas relies heavily on the Ogallala Aquifer to meet water supply needs. Unfortunately, the aquifer is declining at a faster rate than it can recharge. At the current rate, projections indicate the aquifer will be 70% depleted in the next 50 years if changes in use are not made. These projections suggest water users will be unable to withdraw at current usage rates in 50 years or less (Streeter et al., 2015).

Kansas water policy

Water use is governed at the state level, and guided by a system of water rights outlined by the Kansas Water Appropriation Act (Streeter et al., 2015). Water rights grant the holder the

right to use the appropriated amount of surface and groundwater for beneficial purposes. Appropriation is based on the date of the right, rather than the use; therefore, if supply is not sufficient enough to meet total demand, the most senior water right reserves priority (Kansas Department of Agriculture – Division of Water Resources [DWR], 2016).

Kansas water resources are managed in a variety of ways. There are five Groundwater Management Districts (GMDs), positioned in the central and western areas of the state. Local boards govern the districts and play a role in providing information and planning according to research and regulatory needs in each area (Kansas Geological Survey [KGS], 2015). Local Enhanced Management Areas (LEMAs) then designate authority to local GMDs to consider localized conservation plans and goals through local public hearings (Kansas Department of Agriculture [KDA], 2016).

Statewide emphasis on protecting water resources

A statewide focus on water resource management has ensued in recent years. The focus might largely be attributed to the aforementioned challenges related to ensuring an adequate water supply in the future. Additionally, Kansas Governor Sam Brownback issued a call to action to his administration in 2013, noting the impact of water resources on the state economy. The call was to develop a long-term vision for the state's water supply, created by public input. Areas of emphasis outlined in the resulting document include education and workforce development (Streeter et al, 2015).

Problem Statement

Education faces the challenge and opportunity of building a workforce prepared to meet societal needs. In a quickly changing world, this means constantly evolving and adapting to prepare students for careers related to both current and future demands. Significant focus in

education has been placed on emphasizing employability skills to prepare job seekers for the workplace. Since the Great Recession, however, researchers have identified a skills gap, in which applicants' job-specific skills do not align with requirements, especially in STEM fields (Cappelli, 2015; Wright, 2013). This suggests a need for a focus on technical skill development in these career areas. A topic that falls in many STEM fields is water resources. In Kansas, both supply and demand of water resources vary greatly across the state. A growing trend statewide, however, is a need to focus efforts on preserving the quality and quantity of Kansas' water supply. Anecdotal evidence suggests the focus on water resources increases the demand for employees prepared for careers in water-related STEM fields (S. Metzger, personal communication, May 3, 2016). Research to determine the demand for employees in water-related positions and professional development needs of employees in these positions is needed to address the growing emphasis on water resources management statewide and the need to prepare future employees for relevant STEM careers.

Research Purpose and Questions

With the decreasing supply and increasing demand on Kansas' water resources comes a statewide, multi-industry focus on finding solutions to preserve the quality and quantity of the water supply. Finding those solutions requires a prepared workforce. The nation's workforce is characterized by a skills gap, particularly in the STEM fields needed to address Kansas' water resource challenges. Therefore, ensuring current and potential employees in water resources are prepared to address those challenges, and if not, identifying methods of better preparing them to address those challenges is necessary in maintaining the state's water supply. The purpose of the study is to examine the professional development needs of employees in water-related careers. Specifically, the study addressed the following research questions:

- Do current and potential employees' abilities and needs correspond to job requirements and reinforcements in career areas related to water resources in Kansas?
- What adjustments to abilities and/or needs are necessary to allow current and potential employees in water-related careers to achieve a stable work personality?
- What investments in human capital would help meet Kansas' needs in managing water resources?

Overview of the Methodology

This mixed methods study was designed through the perspectives of quantitative descriptive survey research and symbolic interactionism. Survey research was used to compile descriptive data. An electronic questionnaire was distributed to gain an understanding of the labor market related to water resources. Descriptive statistics were generated and analyzed. Qualitative interviews were designed through the lens of symbolic interactionism to understand the meanings professionals in hiring positions for water-related positions have made through their experiences. Transcripts were coded, and themes emerged and were analyzed.

Definition of Key Terms

In the context of this study:

- "professional development" refers to any experiences current or potential employees might have intended to prepare them for their current or future occupations
- "water-related careers" refers to any positions with major tasks related to water resources

Chapter 2 - Review of the Literature

Chapter Overview

This chapter includes the researchers' review of the literature. First, the chapter focuses on the skills gap, including a description of where the skills gap exists in the workforce, causes and how it could be addressed through skill development, described in existing literature. Then, the theoretical framework describes two theories providing a basis for this study – the Human Capital Theory and the Theory of Work Adjustment.

Skills Gap

To understand how to prepare a workforce to meet these needs in water resources, a review of literature related to job seekers' levels of qualification for today's workforce was needed. A dearth of research related to water resources was revealed. BLS (2015) noted a sparsity in detailed data for STEM labor markets.

Where the gap exists

The literature indicated the existence of a skills gap specifically in STEM areas (Cappelli, 2015, & Wright, 2013). STEM professionals played a large role in innovation and technology in the United States economy, so these professionals were consistently in demand to address these advancements as they continued to reshape the workforce (DPE, 2016). Gray and Herr (2006) noted an "unprecedented shortage of skilled workers" (p. 17). They predicted our nation's gross domestic product could decrease by 5% due to the shortage.

While some literature indicated a shortage of STEM workers, however, others reported a surplus – a discrepancy that could have been attributed to a diverse labor market (BLS, 2015). BLS suggested that many studies had analyzed aggregate data on the science and engineering workforce, but less so on specific STEM job market segments. The study indicated that this

could have presented a challenge in reporting supply and demand-type data, as "STEM supply-and-demand dynamics involve[d] many actors – students, current STEM workers, educational institutions, government, and the private sector" ("Methodology and data," para. 1) each of which impact the market in different ways (BLS, 2015).

The same study suggested that if STEM occupations were described by academic, government, and private sectors; the academic sector could typically be described as oversupplied, while the government and private sectors had shortages in some areas. Specifically, the study noted high demand for engineers, software developers, data scientists and those in the skilled trades. Geographic location also seemed to play a role; data showed regional differences in the labor markets for these fields (BLS, 2015). Sentz (2013) specified that, although the skills gap was a national issue, it could have been described as a "multifaceted phenomenon perpetuated by hundreds of regional labor market interactions" (para. 6).

Causes of the skills gap

Overall, organizations were facing a high rate of retirement among the "baby boomer" generation, taking with them knowledge and experience (Carnevale, 2003). When considering the lasting effect this had on organizations, job seekers needed to be prepared to fill the knowledge and experience gap left in their places. In addition to generational trends, discussions existed related to shifts in the economy. Wright (2013) identified a growing trend in the years following the Great Recession, and noted that "unemployment rates ha[d] remained stubbornly high despite increases in job openings" ("Introduction," para. 1).

CareerBuilder (2014) conducted a survey to better understand the skills gap. The results of the survey indicated that "more than half of surveyed employers reported they ha[d] open jobs for which they cannot find qualified candidates" (p. 3). Additionally, "81 percent claim[ed] it

[was] at least somewhat difficult to fill job vacancies" (p. 3). Managers preferred employees who were already equipped with job-specific skills and were ready for immediate work upon arrival in the workplace (p. 4). The study also asked respondents for possible reasons for the skills gap. While both employers and job seekers agreed disparity often existed in regard to wage expectations, employers specifically blamed the gap on a general lack of skills among applicants. In the survey, job seekers were asked to consider factors including changing technologies, job outsourcing, wage expectations, lack of knowledge about career opportunities, access to education and too-specific job requirements. They identified education and on-the-job training gaps as the top two causes of the skills gap. Employers, too, ranked education gaps as the top cause, and many reported that they either could not fill job vacancies or had to hire unqualified applicants (CareerBuilder, 2014). Hira (2010) also summarized key factors influencing the appeal of positions into a list that included rewards such as wages, job satisfaction, and the work environment; the level of risk and uncertainty associated with finding and maintaining a job in the specified field; employment trends and forecasts; and characteristics of the talent pool.

Skill development

Much of the focus in recent years on today's workforce had been on employability skills, often termed "soft skills." Robinson and Garton (2008) studied agriculture graduates' perceptions of the importance and their competence in skills such as problem solving, positive attitude, time management, listening, working under stress and working independently. Jackson (2010) also focused on a list of employability competencies, including communication, listening, giving and receiving feedback, maintaining relationships, critical thinking, decision management, and problem solving.

Cappelli (2015) identified two challenges related to the supply of skills in the workforce,

however. While the most prevalent complaint among employers was the lack of basic employability skills, Cappelli noted the second complaint remained that of the skill shortage in job-specific skills. According to Jackson (2010), while there had been an increased focus on employability skills, discipline-specific skills were still considered important. Cappelli (2015) suggested the focus on employability skills came as a result of the Secretary's Commission on Achieving Necessary Skills (SCANS) report, but industry had since indicated a need to shift the focus back to skills related to STEM. Discussion and evidence related to the focus on and achievement in technical skill areas was limited in the United States.

Further, human capital was an economic driver, and employer access to qualified job seekers was a must. CareerBuilder (2014) suggested one possible solution to the problem was to increase conversation between academia and employers to better understand how to prepare students for the specific jobs. Yang (2013) noted a challenge in academia in adequately preparing students for jobs that did not yet exist in a fast-changing society, and suggested job seekers had the responsibility of continually identifying specific training and education opportunities.

Theoretical Framework

Human Capital Theory

The Human Capital Theory ascertained that increasing human resources – knowledge, skills, health, or values – offered benefit to the individual and society as a whole. Human capital investments might have included both formal education and on-the-job training, both of which might have been considered the most important types of investments in human capital (Becker, 1993). Education offered satisfaction to the individual, while also offering economic and social benefits by serving as a factor in developing human resources (Almendarez, 2013). In fact,

Almendarez (2013) suggested economically productive human capability was a product of individuals' innate abilities and human capital investment. Therefore, investment in human capital through education increased individuals' productivity and efficiency. According to Little (2003),

> The propositions of human capital theory were that the skills that people acquire [were] a form of capital, human capital; that these [were] acquired through deliberate investments in education; that skills [were] the capacities that contribute to economic production; and that earnings in the labour market [were] the means by which a person's productivity [was] rewarded (p. 483).

To better understand the role of the human capital theory in the agricultural industry, Roberts and Ball (2009) developed a conceptual model (see Figure 1). The model demonstrated the need for educational experiences to reflect the needs of the agricultural industry. The model emphasized that both educators' technical knowledge and the curricula they taught should be based in the agricultural industry. This led to the instruction and skill acquisition students receive, which resulted in a skilled worker who then applied the knowledge and skills through employment in the agricultural industry.

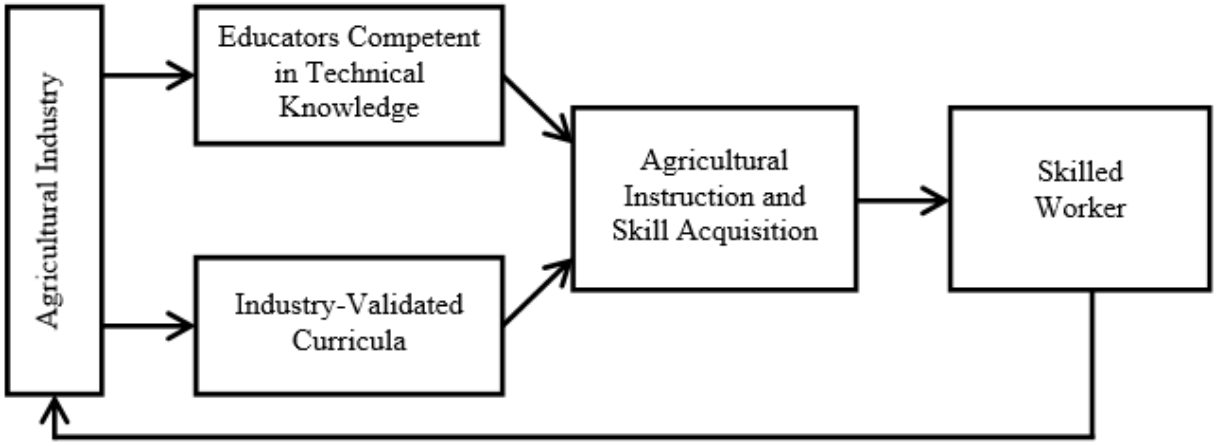

Figure 1. Roberts & Ball's (2009) content-based model for teaching agriculture. Educators' knowledge and the curricula for teaching was relevant to the industry, which allowed the student to learn and gain relevant skills. This, in turn, resulted in a skilled worker, who was prepared to contribute to the industry.

For the purpose of this study, the researchers provided an adaptation to Roberts & Ball's (2009) model (see Figure 2). This model demonstrates basing educators' technical knowledge and professional development resources on specific occupational areas related to water resources, delivered through instruction and experiences that equip individuals with necessary skills. The result is a skilled workforce, applying the knowledge and skills through employment in water resources-related fields.

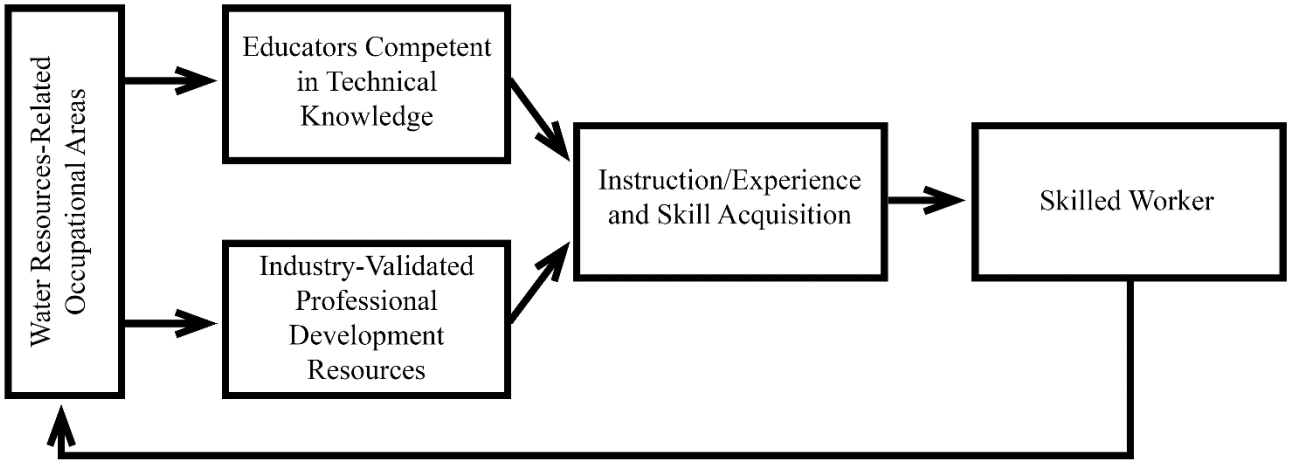

Figure 2. Content-based model for preparing a water resources workforce (adapted from Roberts & Ball, 2009). Educators' knowledge and the curricula for teaching was relevant to water resources-related occupational areas, which allowed the student to learn and gain relevant skills. This, in turn, resulted in a skilled worker, who was prepared to contribute to society by serving in water resources-related occupations.

Research supporting investments in human capital was largely backed by evidence of higher education resulting in higher income. According to Becker (1993), even after consideration of the direct and indirect costs of attending school, receiving an education increased an individual's income. On-the-job training ranging from one-hour to multi-year commitments offered additional opportunity to increase earnings. Research also suggested it increased an individual's likelihood of remaining with a job, as they built positive relationships with their employers through training experiences.

The theory faced some dispute when the fear of "overeducated Americans" led to a lesser difference in average income between high school and college graduates. Some also argued that education did not so much increase an individual's productive, skill-specific capabilities; rather, it provided an idea that more highly educated individuals were simply more motivated or persistent. There were also arguments that the correlation between investment in human capital and income was actually due to the effect of income on education, singling out the most

favorable groups (Becker, 1993). Additionally, other than utilizing possible resulting, tangible indicators of growth such as income, the value of human capital was really that which could not be separated from the individual – knowledge, skills, health, or values (Becker, 1993).

Theory of Work Adjustment

The Theory of Work Adjustment (see Figure 3) – created by Dawis, England, and Lofquist (1964) – was structured around the concepts of stimulus, response and reinforcement. The theory characterized individuals as organisms that responded to a stimulus, and "reinforcers" ensured the individual continually had an environmental condition to respond to. From the perspective of an individual's work, the locus was the work environment, which was further defined in terms of the position, job or occupation. In the context of workplace learning, the theory outlined a process in which individuals developed a variety of response capabilities through interactions with the work environment.

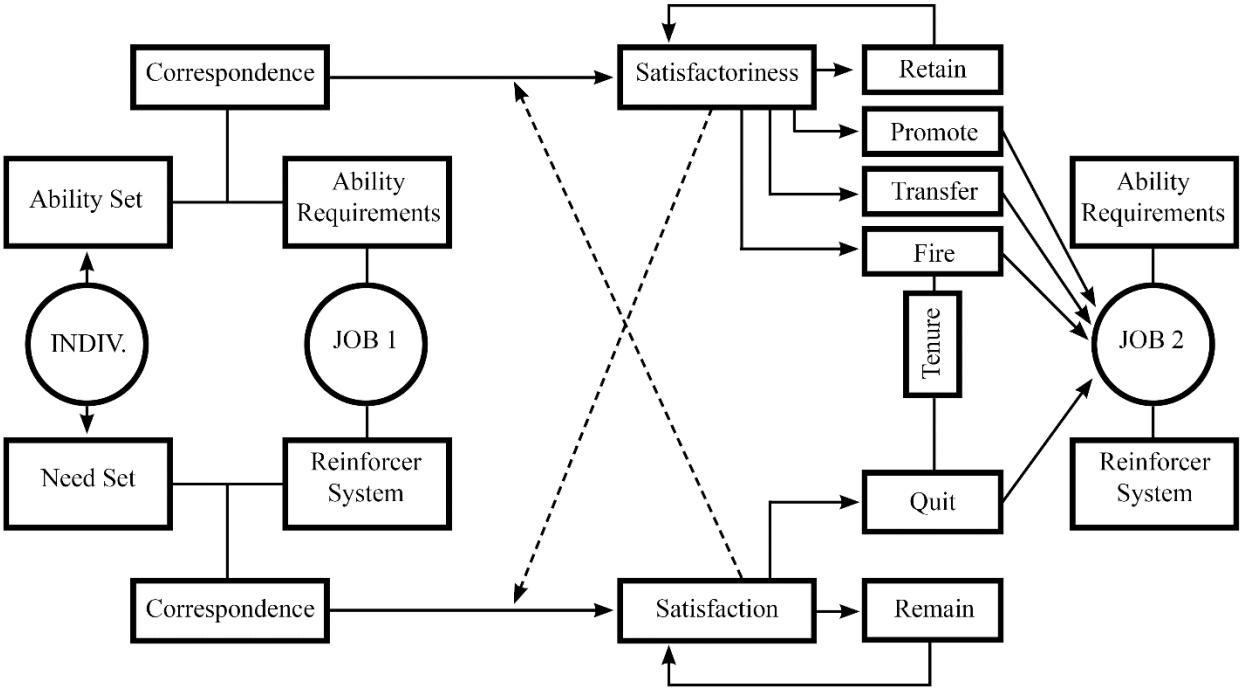

Figure 3. Theory of Work Adjustment model (Dawis et al., 1964). The individual worker underwent a continuous process of adjusting his or her ability and need sets, while the workplace underwent a continuous process of adjusting the ability requirements and reinforcer systems of the job. When little change was needed, the worker achieved a stable work personality.

The work environment might have been described by the behaviors deemed appropriate and the available stimuli, or reinforcers. Reinforcers were most often presented through the payment of wages. The reinforcers in the environment that occurred most frequently were termed "needs." These were the components of the job that encouraged the individual to work. Needs were quantified by strength, or the value of the reinforcement relative to other needs. The strength of the need depended on frequency, as well as the strength of the associated response (Dawis et al., 1964).

The responses the individual used most frequently, on the other hand, are referred to as "abilities." Abilities, too, were quantified by strength. The strength of the ability was described

by the speed or power at which the individual could respond and had responded in the past, as well as the strength of the associated reinforcer (Dawis et al., 1964).

The similarity between an individual's abilities and the job's ability requirements, or between the individual's effective reinforcer system and the job's needs, was termed "correspondence." Varying levels of correspondence between the individual's abilities and needs and the work environment's requirement-reinforcer systems resulted in a change in the individual's abilities and needs. Both the individual's abilities and needs tended to become more specific as the individual pursued a specific lifestyle, while the requirement-reinforcer conditions remained relatively fixed. Different social-educational requirements utilized different abilities, which resulted in more specific abilities working at different strengths. The different social-educational reinforcer systems also required different sets of specific needs at different strengths (Dawis et al., 1964).

In this theory, the individual's action, reaction and acknowledgement of the work environment was described as the process of work adjustment. Evaluations of an individual's work performance were taken from two perspectives – that of the individual and that of the employer. From the individual's perspective, "satisfaction" described the evaluation of the effectiveness of the work environment's reinforcers on his or her behavior. In other words, "satisfaction" evaluated how well the stimulus conditions of the work environment reinforced the employee's behaviors. From the employer's perspective, "satisfactoriness" evaluated the individual's work behavior in terms of the quality and quantity of task performance and outcomes. Eventually, measurements of an individual's ability and need sets showed no significant change. This was referred to as a stable work personality (Dawis et al., 1964). See Table 1 for a summary of the components of the model.

Table 1

Theory of Work Adjustment Model Components

Component	Description
Need set	Components of the job that encouraged the employee to work
Reinforcer system	Stimuli for employees to respond to
Correspondence	Similarity between the employee's needs and employer's reinforcer system
Satisfaction	Employee's perception of how well the employer's reinforce system met the employee's needs
Ability set	Knowledge and characteristics of which the employee was equipped
Ability requirements	Employer's job requirements
Correspondence	Similarity between an employee's abilities and the employer's job requirements
Satisfactoriness	Employer's perception of how well the employee's ability set met the employer's ability requirements

Because of its focus on investing in the skills and knowledge of potential employees for the benefit of increasing their productivity, the Theory of Work Adjustment was used by Robinson and Garton (2008) as a theoretical framework for their study assessing employability skills needed in agriculture graduates.

Chapter Summary

This chapter described, in detail, the literature reviewed by the researchers for the purpose of this study. Literature indicated the existence of a skills gap, particularly in STEM-related fields. Some literature described a shortage of employees in such occupational areas, while other literature described a surplus. This discrepancy could possibly be attributed largely to a diverse labor market, in which varying market sectors, positions, and geographical locations

impact the labor market in different ways. A variety of factors influenced an individual's decisions related to finding and maintaining employment. While significant focus in education had been on employability skills, some employers indicated a need to refocus attention on technical skill attainment to better meet job requirements.

The Human Capital Theory and the Theory of Work Adjustment provided a theoretical framework for this study. The Human Capital Theory ascertained that investments in human capital – including education and training – benefit both the individual and society as a whole. By basing education and professional development opportunities in specified areas of industry, these investments in human capital could result in a skilled workforce prepared to meet the needs of their specified fields. The Theory of Work Adjustment described the ongoing process an employee undertakes to meet the needs of the workplace, and vice versa. The employee and employer consistently work to achieve a stable work personality, in which the levels of correspondence between the employee's abilities and the ability requirements of the workplace, as well as between the employee's need set and the workplace's reinforce system, show no significant change.

Chapter 3 - Methodology

Chapter Overview

Descriptive survey research and symbolic interactionism provide the methodological basis for this study. The quantitative portion of the study was designed to address the first research question: Do current and potential employees' abilities and needs correspond to job requirements and reinforcements in career areas related to water resources in Kansas? Survey research was selected to obtain self-reported descriptive data (Hutchinson, 2004).

The qualitative portion of the study was focused on answering the remaining two research questions regarding adjustments to abilities and/or needs necessary to allow individuals to achieve stable work personalities, and investments in human capital needed to help meet Kansas' needs in managing water resources. The interviews were conducted through the perspective of symbolic interactionism, which Blumer (1969) outlined on three premises. First, individuals create meanings for their experiences through social interactions. Second, they act on the basis of the meanings they have created. Third, they use an interpretative process to handle and modify the meanings they have created (Blumer, 1969). In the context of this study, the researchers aimed to derive meaning from participants' experiences hiring individuals for relevant positions to understand professional development needs.

This chapter describes, in detail, the mixed methodology the researchers used to carry out this study. It includes descriptions of the study participants, data collection processes, sampling methods and data analysis methods, and concludes with identified limitations of the study.

Study Participants

The process of identifying participants for this study demanded special consideration of the scope and complexity of the population. In an effort to include as many organizations with

water-related positions in Kansas as could be identified, the researchers utilized an existing attendee list for the Governor's Water Conference, conceived by the Kansas Water Office. The conference was intended to bring together individuals representing all water-use categories in Kansas for collaborative purposes. Therefore, in coordination with Susan Metzger [the Water Vision Team representative] – Kansas Department of Agriculture Assistant Secretary, former Kansas Water Office Chief of Planning and Policy and representative of the Kansas Water Vision team – the researchers identified the list as a comprehensive approach to including individuals representing organizations with positions in each of the following water-use categories – irrigation, stockwatering, industrial, municipal, recreation/conservation and legal. More detailed descriptions of participant selection are included in the following sections, specific to the individual data collection methods used for the study.

Data Collection

Questionnaire

The researchers surveyed individuals representing organizations with water-related positions to identify the demand for water-related jobs in Kansas and the supply of individuals prepared for such positions.

Participants

The study population consisted of all employees in Kansas with water-related job responsibilities. The aforementioned Governor's Water Conference attendee lists from both 2015 and 2016 were compiled and used as the sample frame. From there, the Water Vision Team representative reviewed the list to ensure it reflected the six water-use categories identified previously, and removed duplicates to avoid including too many individuals from the same organization or including individuals who attended the conference during both years and were

listed twice on the list. The Water Vision Team representative also removed those whom they did not believe would have knowledge of their respective organizations' hiring processes and decisions. After the Water Vision Team representative sent an initial email introducing the study to the participants, which will be described later, they removed any email addresses that either resulted in bounced emails or responses from recipients indicating they would not have input for the study (S. Metzger, personal communication, November 11, 2016). The resulting list included a sample of 754 who were sent the questionnaire. The list was then reduced to 740 participants after the questionnaire was distributed, due to incorrect email addresses.

Design

The electronic questionnaire was designed based on an instrument used for an unpublished agricultural workforce report and secured through the Kansas Department of Agriculture, and developed in Qualtrics. Because the example questionnaire was intended to gather data for a different population, the researcher made revisions to better address the research question posed. The resulting questionnaire consisted of 20 to 22 questions, depending on the participant's responses. Questions were designed to seek data related to the current supply of and demand for employees in water-related positions, existing professional development opportunities and gaps, and projected demand for employees in water-related positions.

After receiving an initial round of feedback regarding the questionnaire's design from a panel of four experts on social data collection, the revisions outlined in Table 2 were implemented. The resulting questionnaire consisted of 23 to 25 questions, depending on the participant's responses.

Table 2

Questionnaire Revisions Following Initial Feedback

Initial Draft	Revisions	Rationale
N/A	All references to new hires, applicants and candidates were changed to "candidates."	Feedback indicated a need to ensure consistent language was used.
"Which of the following job titles best describe the water-related positions in your organization?"	Changed to "Which of the following occupational categories best describe the water-related positions in your organization?"	Feedback indicated the length of the questionnaire was too long due to the long list of job titles. Instead, participants could select from nine occupational categories – professional, technical, and managerial; clerical and sales; service; agricultural, fishery, forestry, and related; processing; machine trades; benchwork; structural work; and miscellaneous. These occupational categories were identified from the Information Technology Associates' (2011) Dictionary of Occupational Titles.
N/A	All references to areas or job titles were changed to "occupational categories" based on the previous change.	Language needed revisions to be consistent with the previous change.
N/A	"Does your organization currently provide internships?" was added.	Feedback suggested adding the question to gain a better understanding of existing professional development opportunities provided by the organizations.
"Rank the following factors by importance in making hiring decisions for water-related career positions (1=Most Important)."	Changed to "Rate the level of importance of the following factors in making hiring decisions for water-related career positions requiring at least a bachelor's degree."	Feedback indicated designing a question with this many responses to consider as a ranking question might discourage participants from completing the questionnaire.

Table 2

Questionnaire Revisions Following Initial Feedback (Continued)

Initial Draft	Revisions	Rationale
N/A	Added "Which does your organization value more in candidates for water-related positions requiring at least a bachelor's degree: education or experience?"	Feedback indicated this question was missing but would generate important data.
"To what extent do you agree that quantity and quality of graduates in water-related areas impacts opportunities for organizational growth?"	Divided the question into two questions and revised the language: "To what extent do you agree that **QUANTITY** of graduates in water-related areas is the limiting factor impacting opportunities for organizational growth?" and "To what extent do you agree that **QUALITY** of graduates in water-related areas is the limiting factor impacting opportunities for organizational growth?"	Feedback suggested emphasizing that the question was referring to major limiting factors. Further, the initial question asked two questions, and needed to be divided.

Validity test

To test the questionnaire for validity purposes, the researchers piloted the instrument by distributing the questionnaire to 11 individuals representing Kansas State University, the Kansas Department of Agriculture and the Kansas Water Office. The individuals were selected by KDA based on their similarities in positions and experiences to those in the sample. Validity test participants were asked to complete the questionnaire as participants would, and provide feedback according to, but not limited to, these questions:

- Approximately how long did it take you to complete the questionnaire?
- Are questions clear and not subject to multiple interpretations? If not, which questions need improvement? Please provide details of what is unclear.
- Are any questions redundant/repetitive? If so, which questions?
- Is the sequence of the questions easy to follow?
- Is the length of the questionnaire appropriate?
- Is the layout of the questionnaire easy to read?
- Does the questionnaire appear professional and valid?
- The goal of the questionnaire is to answer the following research question: Do current and potential employees' abilities and needs correspond to job requirements in career areas related to water resources in Kansas? In your opinion, does the questionnaire help accomplish the research question? If not, which questions should not be included, or what questions would you suggest adding?

Of the 11 individuals asked to participate in the validity test, 10 completed the questionnaire and six provided feedback. After compiling validity test feedback, the revisions

outlined in Table 3 were made to the questionnaire. The resulting questionnaire consisted of 25 to 27 questions, depending on the participant's responses.

Table 3

Questionnaire Revisions Following Validity Test

Initial Draft	Revisions	Rationale
N/A	"Select all that apply" was added to all questions with the option to provide multiple responses.	Feedback indicated respondents may not notice when they can select multiple responses.
The salary ranges participants could select for "What are the current salary ranges for water-related positions in the following occupational categories?" began at $40,000.	Added "<$20,000" and "$20,000-29,999" as response options.	Feedback indicated "$40,000" was too high for the lowest salary range option.
"What resources would your organization utilize, if provided, to offer professional development opportunities for employees in water related positions?"	Changed to "What resources would your organization utilize, if provided, to offer professional development opportunities for employees in water related positions? Select all that apply."	Feedback suggested allowing multiple responses.
N/A	"Of the resources you selected, drag each option to rank the resources in order of your preferred source of professional development (1=Most Preferred)" was added following "What resources would your organization utilize, if provided, to offer professional development opportunities for employees in water related positions? Select all that apply."	Feedback suggested adding the question to gain a better understanding of participants' preferences, with concern that participants could simply select all of the options and not provide clear data on preferences.

Table 3

Questionnaire Revisions Following Validity Test (Continued)

Initial Draft	Revisions	Rationale
"What is the highest level of education your organization requires of new hires in the following positions?"	Changed to "What is the minimum level of education your organization requires of candidates for the following occupational categories?"	Feedback suggested "highest level of education" would rarely be as language used in hiring processes, as levels of education they prefer and those they actually require are often different.
"Rank your preference when hiring for water-related positions (1=Most likely to hire)."	Changed to "Rank your preference when hiring for water-related positions (1=Most likely to hire) by dragging each option into the appropriate order."	Feedback indicated confusion regarding the questionnaire functionality in responding to this question, so clearer directions were needed.
"Rate your agreement regarding the majority of applicants your organization selects for interviews for vacant water-related positions."	Changed to "Considering recent candidates for vacant water-related positions in your organization, to what extent would you agree the following were factors influencing your decision **NOT** to hire."	Feedback indicated a need to rephrase to add clarity.
N/A	Added "Which key traits or skills are most lacking in candidates for water-related positions in your organization?"	Feedback suggested adding an open-ended question at the end of the section of the questionnaire focusing on professional development needs, as there was not an opportunity to include job-specific skill gaps.
N/A	"N/A" was added to all questions where applicable.	Since responses were required for each question, feedback suggested adding "N/A" so that if a participant struggled to respond to a question, it would not discourage the participant from completing the questionnaire.

Distribution

Following the Dillman Tailored [Survey] Design Method (Dillman, Smyth & Christian, 2009), the Water Vision Team representative sent an initial email to all participants, sharing the relationship between the purpose of the study and the statewide initiatives focused on water resources. The questionnaire was then distributed to 754 participants using Qualtrics' email feature. Participants received an email with a link to the questionnaire, and were provided a deadline 15 days from the date the questionnaire was sent. Reminder emails were sent to those who had not yet completed the questionnaire after both seven and 14 days of response collection.

Instrument reliability

With the exception of questions 18, 20, 30 and 31, questionnaire items were considered to be descriptive in nature. As a result, reliability estimates for the overall instrument were deemed inappropriate. Post hoc reliability estimates were calculated using Cronbach's alpha for the four perception items. Those estimates were as follows. The construct related to factors of importance when making hiring decisions (question 18 – 14 parts) yielded a Cronbach's alpha of .745. The construct related to factors influencing decisions not to hire candidates (question 20 – six parts) yielded a Cronbach's alpha of .783. Finally, the construct related to limiting factors for organizational growth (questions 27 and 28) yielded a Cronbach's alpha of .677. All reliability estimates were determined to be acceptable.

Interviews

The researchers conducted interviews with twelve individuals who had expertise in their respective organizations' hiring processes for water-related positions. The interviews were intended to identify adjustments to abilities and/or needs necessary to allow individuals to

achieve stable work personalities, and investments in human capital needed to help meet Kansas' needs in managing water resources.

Sampling methods

The Water Vision Team representative and the Kansas Water Office assisted in the selection of interview participants, based upon the suggested participants' participation in the public input process for the Long-Term Vision for the Future of Water Supply in Kansas. Two individuals were selected from each of the six water use categories mentioned previously - irrigation, stockwater and waste, industrial, municipal, recreation and conservation, and legal. One individual in each category represented the public sector, and one represented the private sector. More than two suggestions were made for a few of the categories. The initial suggested participant list included:

- three names in the irrigation category
- two names in the stockwatering category
- three names in the industrial category
- five names in the municipal category
- three names in the recreation/conservation category
- four names in the legal category

To narrow the list to the sample of twelve participants, participants were grouped by sector within each category, and an online random name generator was used to randomly select the participant. For example, in the municipal category, two of the five individuals represented the public sector and the remaining three represented the private sector. Therefore, one name was randomly drawn from the two individuals in the public sector, and one name was randomly drawn from the three individuals in the private sector.

Interview design

The researchers developed a semi-structured interview protocol, consisting of 10 questions. Questions included:

- What abilities and characteristics describe the ideal applicant for your water-related positions?
- What abilities do job applicants for water-related positions typically demonstrate well upon hire?
- What ability gaps do you typically observe in job applicants for water-related positions?
- How do you see the abilities needed for employees in your water-related positions changing over the next ten years?
- What professional development opportunities does your organization currently provide for employees in water-related positions?
- For which abilities would your organization prefer to train employees internally?
- For which abilities would your organization prefer external sources provide training?
- What does the organization do to reinforce the importance of professional development once the employee is in the workplace? (Or how are employees encouraged or rewarded for participating in professional development opportunities?)
- How does your organization continually evaluate the employee's abilities to meet the needs of the position?
- In your opinion, what steps – if any – need to be taken to address the supply of candidates for positions like those we've discussed?

Researchers then tested the interview protocol and recording equipment by interviewing a representative of the Kansas Department of Agriculture who served in a position similar to those

of the selected interview participants. Based on the feedback received during the test interview, an additional question was added to the protocol: “In regard to anything we’ve discussed, what are you hearing from other organizations with water-related positions?”

Conducting interviews

Similar to the process followed to introduce the questionnaire, the Water Vision Team representative sent an initial email to the twelve selected participants. A second email was then distributed, asking the recipients to respond with their interest and availability in participating in the study. Follow-up emails and phone calls were then provided as needed to schedule interviews. One of the selected participants denied participation, and the researchers were unable to reach one of the other selected participants. For each, a new participant was randomly selected from the original list of names and contacted following the same process.

In-person interviews were conducted at the participants’ work locations. The researcher followed the interview protocol, and only added additional language or probing questions as needed to help the participants address the questions asked. The interviews lasted approximately 20 to 30 minutes, and were recorded using two voice recording devices.

Subjectivity Statement

Bhattacharya (2007) discussed how a researcher’s “assumptions, beliefs, and values” can inform how the researcher conducts research. Therefore, it is important for a researcher to discuss such subjectivities (Bhattacharya, 2007). I have acknowledged how my own prior experiences and interactions related to water resources in Kansas have impacted my understanding of this study and have attempted to keep these perspectives in front of me through the process of data collection and analysis.

For three years of my undergraduate career at Kansas State University (KSU), I was an intern at the Kansas Department of Agriculture. One of the major projects in which I had the opportunity to be involved was the public input process for *A Long-Term Vision for the Future of Water Supply in Kansas.* Over the course of a few months, I traveled statewide with the Water Vision Team – made up of Kansas Department of Agriculture and Kansas Water Vision professionals – to engage in conversations with Kansas citizens and collect public input. I then played a role organizing the data, which would eventually be used to develop the Vision document. Further, I regularly attended internal meetings focused on the Vision with the team.

After concluding my internship, I remained somewhat engaged in the implementation process for the Vision's action items. The Vision team had decided to facilitate an idea-sharing process for implementation by coordinating stakeholder input meetings, and I was invited to take part in input meetings related to water conservation education. I attended the first few meetings with the group of stakeholders. Further, I had the chance to create a water resources-focused curriculum provided by the KSU College of Agriculture for high school science and agriculture classes. This project challenged me to not only learn more about water resources in Kansas, but also interact with professionals in the field through the curriculum's development process.

I recognize that these experiences, as well my interactions with the Water Vision Team, were what initially generated my interest in researching this topic. It was due to these efforts that I recognized the growing statewide emphasis on water resources management. Therefore, it was my assumption, along with personal communication with members of the Water Vision Team, that led me to believe there might be demand for employees in water-related positions and resulting needs for education and professional development. Further, these experiences helped

shape my own opinions and perspectives about the use and management of the state's water resources.

Further, I have been actively involved in career and technical education (CTE) since I was a student in agricultural education in high school. After high school, I remained involved in CTE through career and technical student organizations. While I certainly recognize that involvement in agricultural education and the National FFA Organization has served as the foundation for my interest in CTE, my desire to remain involved in CTE has grown considerably through experiences with SkillsUSA. At times during both my undergraduate and graduate careers, I served as a facilitator for the organization's student conferences and assisted in the development of a few leadership development resources. Through those experiences, I received training that led to a greater understanding of the impact of CTE and the importance of a skilled workforce. My mentors in the organization continually reinforced the importance of technical skill development

Because of these experiences and my ever-growing interest in CTE, the role of education in preparing a skilled workforce is important to me. This led to my own assumptions in this study related to the need to develop a STEM workforce specifically focused in water resources. My personal beliefs place great emphasis on the need to focus on technical skills when preparing such a workforce, which influenced my outlook on the portion of the study focused on professional development needs and opportunities.

Data Analysis

To analyze the survey data, the researchers first utilized Qualtrics' data reports feature to generate initial data for each question asked of participants. Then, some responses were grouped as a means of most effectively representing the data. Descriptive statistics were then used to

further analyze the data; frequencies, means, ranges and percentages were determined as deemed most appropriate. Data will be displayed through text, graphs and tables in the next chapter.

Each interview was transcribed within 48 hours of the interview taking place. Member checks were utilized via email to ensure the transcriptions accurately reflected each participant's intent. Following Glaser's (1965) constant comparative approach to qualitative data analysis, in which the researcher codes the data and generates higher-level themes, the researchers read the transcriptions to identify code and tally responses. The coded data was defined into categories, which were then grouped by sub-themes and overarching themes. At each step, comparisons were made not only with each participant in respect to the full sample of twelve participants, but also in respect to the water-use category represented. Data for the interviews will, again, be displayed in the next chapter.

Limitations of the Study

The researchers recognize certain limitations associated with this study. First, researchers found a few lists of water-related occupations, but found comprehensive lists of water-related occupations in all sectors and industries to be scarce. Further, researchers observed inconsistencies in titles and descriptions of water-related positions. This presented challenges related to framing the population and designing the questionnaire in a way that directly linked participant responses to specific occupations. The researchers, therefore, recognize that some individuals who might have been appropriate to include in the study could have been missed, and there might be room for improvement in designing a survey tool that directly addresses specific occupations.

Second, the occupational categories utilized in the questionnaire could have presented challenges as the participants responded to succeeding questions, based on feedback received

from participants during the data collection process. For example, if a participant selected "professional, technical and managerial" as an occupational category, the questionnaire then only allowed the participant to select one salary range for all employees grouped in that occupational category. This could have resulted in inconsistencies with regard to how participants decided to respond. In fact, a suggestion was made by the panel of experts on social data collection to remove "technical" from the "professional, technical, and managerial" category, as researchers felt the term could apply to more than one category in the context of water resources and could potentially confuse participants. However, the researchers missed implementing the revision, so it is noted as a limitation of the study.

Control for Nonresponse Error

The researchers recognize another limitation due to the questionnaire response rate. Because the response rate was just slightly higher than 30%, caution should be taken when generalizing the results of the study to broader audiences. To address this limitation, the researchers conducted a control for nonresponse error. The Water Vision Team representative offered to provide phone numbers for participants who did not respond to the questionnaire in groups of 50, and the researchers used the phone numbers to ask participants if they would be willing to complete the questionnaire via phone call for comparison purposes. The researchers called each phone number once, unless requested otherwise by the participants, which resulted in 11 completed responses.

The data from the phone calls were then compared to those of the original respondents. No notable differences in the data that would cause concern to the researchers were identified.

Chapter Summary

This chapter provided detailed descriptions of the mixed methods used for this study. A combination of descriptive survey research and symbolic interactionism provided the basis for the methodology. An electronic questionnaire and in-person, qualitative interviews were conducted to gather data, addressing the research questions posed previously. Participants represented six water-use categories in Kansas – irrigation, stockwatering, industrial, municipal, recreation/conservation and legal. Data was analyzed using descriptive statistics for the survey research, and a process of transcribing, coding and analyzing for the interviews, with results of both to be described in detail in the next chapter.

Chapter 4 - Results of the Study

Chapter Overview

This chapter includes an in-depth analysis of the results of both the survey research and qualitative interviews. The survey results are organized by the primary topic areas designed in the questionnaire, including demographical data, supply and demand for water-related positions, job qualifications, professional development and plans for organizational growth. Complete data tables for each question included in the questionnaire can be found in the appendix. The portion of the chapter focused on interview results is organized by interview question in the order by which the questions were asked. The qualitative data gathered for each question are then further organized by sub-themes identified by the researchers.

Survey Results

Who responded

The questionnaire was distributed to a sample of 754 participants. The sample was then reduced to 740 participants after the questionnaire was distributed, due to incorrect email addresses. Of those, 225 completed the questionnaire, resulting a 30.4 percent response rate. Participants were asked to select the district(s) of Kansas in which their organizations were primarily located, as well as the water-use area(s) that best described the focus of their organizations' water-related positions. These demographics are summarized in Figures 4 and 5.

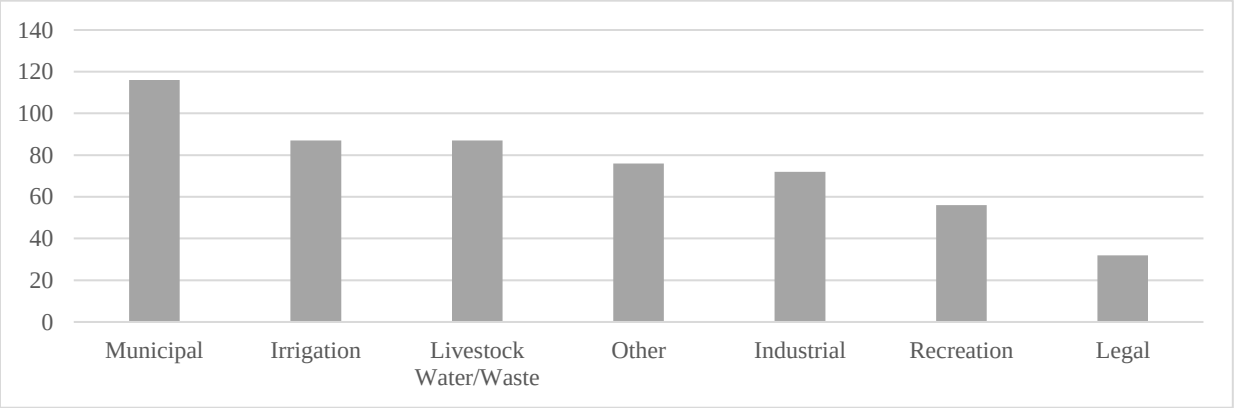

Figure 5. Water-use categories describing the primary focus of responsibilities in water-related positions. While the positions' responsibilities might not solely focus on water resources, the water-use categories further define the responsibilities that do relate to water resources. The number on the axis describes the number of respondents who selected the category (n=225).

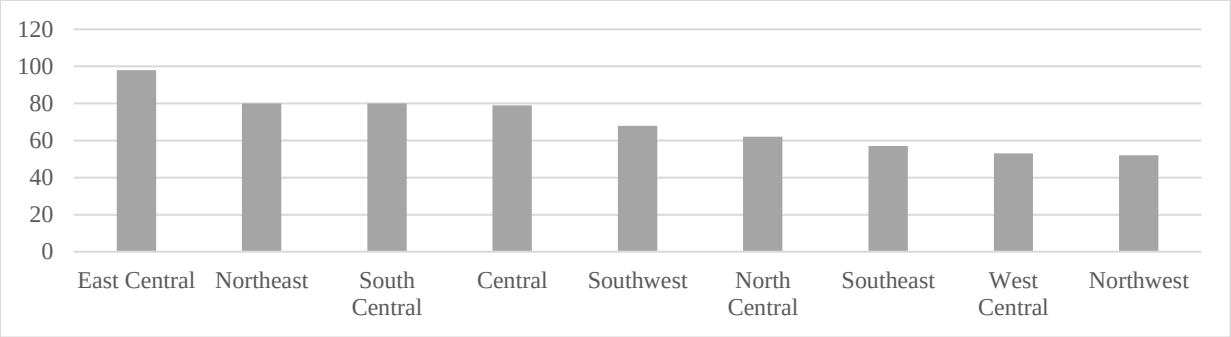

Figure 4. Primary locations, defined by districts of Kansas, of the organizations represented by respondents. The number on the axis describes the number of respondents who selected the district (n=212).

Of the 78 respondents with primary locations in the western side of the state – i.e. responded "northwest," "west central," and/or "southwest" – the majority of respondents included "irrigation" and/or "livestock water/waste" as a primary focus of their water-related positions. Alternatively, of the 242 respondents with primary locations in the central and eastern areas of the state – i.e. responded "north central," "central," "south central," "northeast," "east central," and/or "southeast" – the majority selected "municipal" as a primary focus of their water-related positions. See Figure 6.

Of all 76 respondents who included “other” as a focus of their water-related positions, 70 respondents included an optional text description of the positions. The most common phrases used were related to government or regulations (f=9); research (f=6); natural resources, environment, conservation, or wildlife (f=18); watersheds (f=7); water quality (f=5); and storm water or wastewater (f=5).

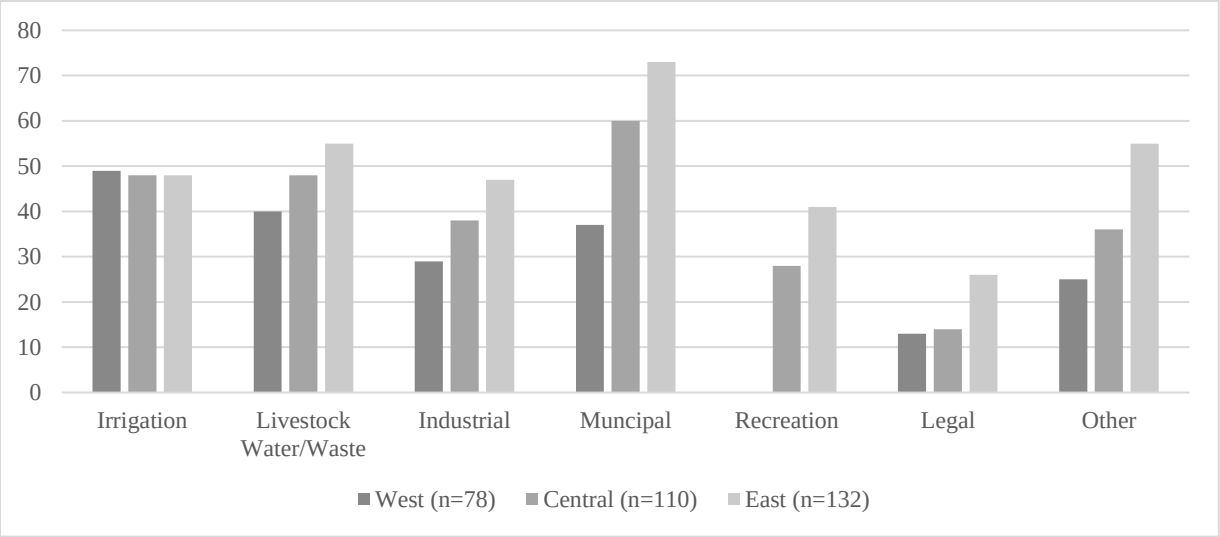

Figure 6. Areas describing the focus of water-related positions by geographical location. “West” represents those who selected northwest, west central, or southwest. “Central” represents those who selected north central, central, or south central. “East” represents those who selected northeast, east central, or southeast. The number on the axis describes the number of respondents from each district who selected each water-use category.

Job supply and demand

Participants were asked a series of questions designed to help researchers understand the supply and demand for individuals in water-related positions. When asked for the average

amount of time positions had remained vacant over the past three years, 120 of 189 respondents selected “less than six months.” See Figure 7.

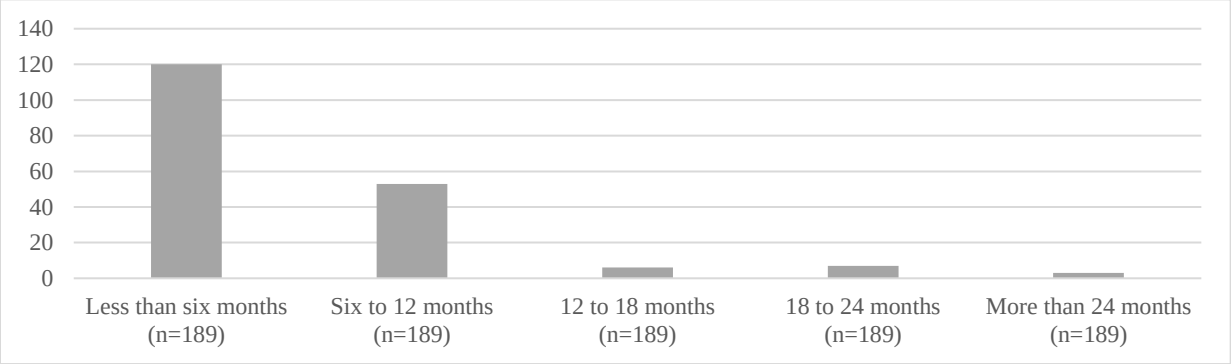

Figure 7. Average vacancy period in the last three for water-related positions. The number on the axis describes the number of respondents that selected each timeframe.

Participants were also asked to categorize some of their responses by job type by first indicating which of nine occupational categories best describe the primary responsibilities of the water-related positions in their organizations (see Table 4). “Professional, technical, and managerial” was the category selected most often, followed by “service” and “agricultural, fishery, forestry, and related.” Fewer than 10% of respondents selected “machine trades,” “benchwork,” “machine trades” and “miscellaneous.”

Table 4

Occupational Categories with Water-Related Responsibilities

Occupational Category	f(%)
Professional, technical, and managerial	173(76.9)
Clerical and sales	28(12.4)
Service	79(35.1)
Agricultural, fishery, forestry, and related	57(25.3)
Processing	23(10.2)
Machine trades	13(5.8)
Benchwork	4(1.8)
Machine trades	13(5.8)
Miscellaneous	15(6.7)

According to the data, organizations with positions in the "clerical and sales," "machine trades" and "miscellaneous" categories most often reported having between one and three current filled and unfilled positions. Those with positions in the "professional, technical, and managerial," "service" and "agricultural, fishery, forestry, and related" categories also typically reported having between one and three current filled and unfilled positions, but at least 20% of respondents in these categories reported having 10 or more positions. Those with positions in the "processing," "benchwork" and "structural work" categories showed less of a trend in their responses, with each option selected by at least 15% of respondents in the respective category.

The majority of respondents reported hiring between zero and three new employees in the past three years. In regard to current vacancies, the most common selection among response options was "0 positions," followed by "1-3 positions." The same selections were most common when respondents were asked for the number of expected vacancies for water-related positions in their organizations. However, more respondents anticipated one to three vacancies in the next

three years than zero vacancies in the professional, technical, and managerial; service; agricultural, fishery, forestry, and related; and processing categories. See Table 5.

Table 5

Supply and Demand for Water-Related Positions

Occupational Category	Description	0 positions f(%)	1-3 positions f(%)	4-6 positions f(%)	7-9 positions f(%)	10+ positions f(%)
Professional, technical, and managerial	Current positions (filled and unfilled) (n=167)	N/A	65(38.9)	28(16.8)	14(8.4)	60(35.9)
	Hires within last three years (n=164)	42(25.6)	77(47.0)	14(8.5)	6(3.7)	25(15.2)
	Current vacancies (n=165)	93(56.4)	53(32.2)	8(4.8)	3(1.8)	8(4.8)
	Expected vacancies in next three years (n=165)	44(26.7)	80(48.5)	18(10.9)	8(4.8)	15(9.1)
Clerical and sales	Current positions (filled and unfilled) (n=26)	N/A	21(80.8)	0(0.0)	2(7.7)	3(11.5)
	Hires within last three years (n=25)	7(28.0)	15(60.0)	1(4.0)	1(4.0)	1(4.0)
	Current vacancies (n=24)	19(79.2)	5(20.8)	0(0.0)	0(0.0)	0(0.0)
	Expected vacancies in next three years (n=26)	14(53.8)	10(38.5)	2(7.7)	0(0.0)	0(0.0)
Service	Current positions (filled and unfilled) (n=74)	N/A	40(54.1)	9(12.2)	7(9.5)	18(24.3)
	Hires within last three years (n=74)	21(28.4)	34(45.9)	7(7.5)	4(5.4)	8(10.8)
	Current vacancies (n=74)	43(58.1)	21(28.4)	6(8.1)	1(1.4)	3(4.1)
	Expected vacancies in next three years (n=73)	17(23.3)	40(54.8)	9(12.3)	1(1.4)	6(8.2)
Agricultural, fishery, forestry, and related	Current positions (filled and unfilled) (n=53)	N/A	32(60.4)	8(15.1)	2(3.8)	11(20.8)
	Hires within last three years (n=53)	21(39.6)	22(41.5)	5(9.4)	1(1.9)	4(7.5)
	Current vacancies (n=53)	44(83.0)	5(9.4)	2(3.8)	0(0.0)	2(3.8)
	Expected vacancies in next three years (n=52)	19(36.5)	25(48.1)	3(5.8)	1(1.9)	4(7.7)

Table 5

Supply and Demand for Water-Related Positions (Continued)

Occupational Category	Description	0 positions f(%)	1-3 positions f(%)	4-6 positions f(%)	7-9 positions f(%)	10+ positions f(%)
Processing	Current positions (filled and unfilled) (n=20)	N/A	5(25.0)	5(25.0)	4(20.0)	6(30.0)
	Hires within last three years (n=22)	9(40.9)	7(31.8)	3(13.6)	0(0.0)	3(13.6)
	Current vacancies (n=23)	15(65.2)	7(30.4)	1(4.3)	0(0.0)	0(0.0)
	Expected vacancies in next three years (n=23)	7(30.4)	12(52.2)	1(4.3)	1(4.3)	2(8.7)
Machine trades	Current positions (filled and unfilled) (n=12)	N/A	8(66.7)	1(8.3)	1(8.3)	2(16.7)
	Hires within last three years (n=12)	6(50.0)	3(25.0)	2(16.7)	0(0.0)	1(8.3)
	Current vacancies (n=12)	11(91.7)	1(8.3)	0(0.0)	0(0.0)	0(0.0)
	Expected vacancies in next three years (n=13)	6(46.2)	6(46.2)	0(0.0)	0(0.0)	1(7.7)
Benchwork	Current positions (filled and unfilled) (n=4)	N/A	1(25.0)	1(25.0)	1(25.0)	1(25.0)
	Hires within last three years (n=4)	2(50.0)	1(25.0)	0(0.0)	0(0.0)	1(25.0)
	Current vacancies (n=4)	3(75.0)	1(25.0)	0(0.0)	0(0.0)	0(0.0)
	Expected vacancies in next three years (n=4)	2(50.0)	1(25.0)	0(0.0)	0(0.0)	1(25.0)
Structural work	Current positions (filled and unfilled) (n=13)	N/A	5(38.5)	3(23.1)	3(23.1)	2(15.4)
	Hires within last three years (n=12)	4(33.3)	5(41.7)	2(16.7)	0(0.0)	1(8.3)
	Current vacancies (n=12)	7(58.3)	5(41.7)	0(0.0)	0(0.0)	0(0.0)
	Expected vacancies in next three years (n=13)	5(38.5)	5(38.5)	2(15.4)	0(0.0)	1(7.7)

Table 5

Supply and Demand for Water-Related Positions (Continued)

Occupational Category	Description	0 positions f(%)	1-3 positions f(%)	4-6 positions f(%)	7-9 positions f(%)	10+ positions f(%)
Miscellaneous	Current positions (filled and unfilled) (n=13)	N/A	8(61.5)	3(23.1)	1(7.7)	1(7.7)
	Hires within last three years (n=13)	6(46.2)	5(38.5)	2(15.4)	0(0.0)	0(0.0)
	Current vacancies (n=12)	11(91.7)	1(8.3)	0(0.0)	0(0.0)	0(0.0)
	Expected vacancies in next three years (n=13)	7(53.8)	5(38.5)	1(7.7)	0(0.0)	0(0.0)

Job qualifications

Participants were asked a series of questions related to their organizations' expectations for potential employees. When asked whether they value education or experience more in candidates, nearly three-fourths of respondents indicated a higher value in experience (see Figure 8).

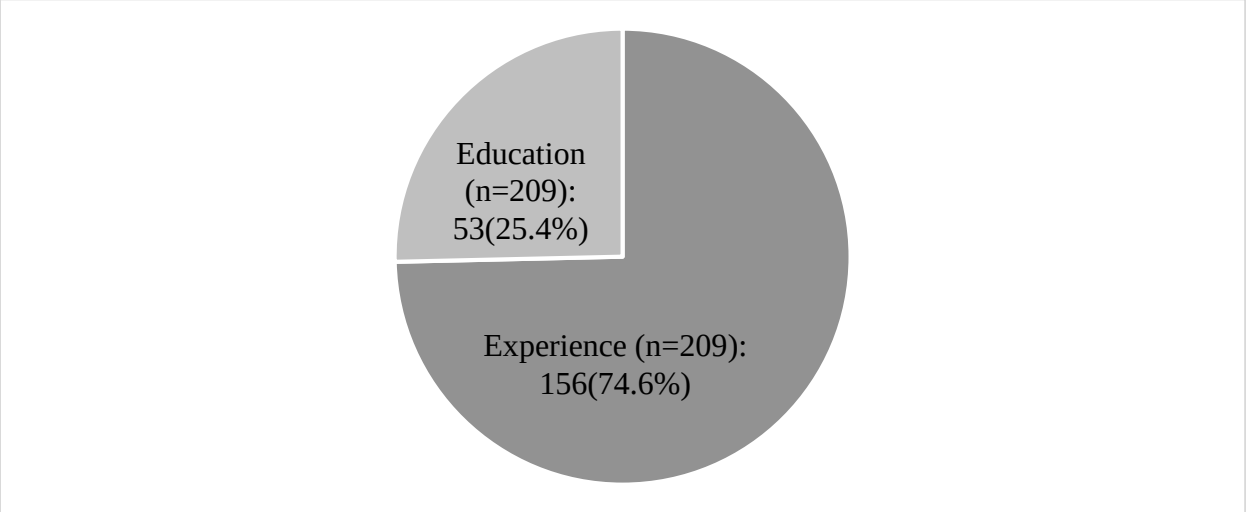

Figure 8. Organizations that most value experience versus education. Data is displayed as f(%).

Further, when asked to rank their preference when hiring for water-related positions, the majority of respondents ranked "current employee" as their first preference, "experienced (in a water-related position)" as their second preference, "inexperienced (in a water-related position)" as their third preference. See Table 6.

Table 6

Ranked Hiring Preferences

Preference	Ranked first f(%)	Ranked second f(%)	Ranked third f(%)
Current employee (n=225)	133(59.1)	76(33.8)	16(7.1)
Inexperienced (in a water-related position) (n=225)	6(2.7)	22(9.8)	197(87.6)
Experienced (in a water-related position) (n=225)	86(38.2)	127(56.4)	12(5.3)

Experience requirements

When asked for the number of years of work experience required by their organizations, participants responded for each occupational category (see Table 7). Across all occupational categories, 45.0% of respondents required one to three years of experience, and 25.7% respondents required no experience. Organizations with positions in the professional, technical, and managerial category indicated requirements with slightly higher levels of experience, with a greater number in that category selecting either one to three years of experience or four to six years of experience than no experience at all. Of the respondents with positions in the professional, technical, and managerial; service; agricultural, fishery, forestry, and related; processing; benchwork; structural work; and miscellaneous categories, a greater number of respondents indicated requiring at least one to three years of experience than no experience. A greater number of respondents in the clerical and sales category indicated requiring no experience, and the same number of respondents in the machine trades category indicated requiring no experience as requiring one to three years of experience.

Table 7

Years of Work Experience Typically Required of Candidates for Water-Related Positions

Occupational Category	0 years f(%)	1-3 years f(%)	4-6 years f(%)	7-9 years f(%)	10+ years f(%)
Professional, technical, and managerial (n=157)	25(15.9)	65(41.4)	44(28.0)	7(4.5)	16(10.2)
Clerical and sales (n=25)	13(52.0)	10(40.0)	2(8.0)	0(0.0)	0(0.0)
Service (n=73)	23(31.5)	39(53.4)	6(8.2)	1(1.4)	4(5.5)
Agricultural, fishery, forestry, and related (n=51)	15(29.4)	24(47.1)	6(11.8)	0(0.0)	6(11.8)
Processing (n=22)	6(27.3)	9(40.9)	4(18.2)	0(0.0)	3(13.6)
Machine trades (n=11)	4(36.4)	4(36.4)	2(18.2)	0(0.0)	1(9.1)
Benchwork (n=4)	1(25.0)	3(75.0)	0(0.0)	0(0.0)	0(0.0)
Structural work (n=13)	4(30.8)	5(38.5)	3(23.1)	0(0.0)	1(7.7)
Miscellaneous (n=13)	4(30.8)	7(53.8)	2(15.4)	0(0.0)	0(0.0)

Educational requirements

The data indicated that most organizations across all categories required at least either a high school diploma or equivalent, or a four-year degree. Those in the professional, technical, and managerial category were the exception. In this category, the majority of respondents (113 of 167) required at least a four-year degree. Only 15 respondents required at least a high school diploma or equivalent and 24 respondents required at least a professional degree. A greater number of organizations indicated that candidates typically have a professional degree than the number of organizations that required it, with 41 of 170 respondents selecting professional degree as the typical level of education.

The data indicated a greater number of organizations required a minimum of a high school diploma or equivalent in the clerical and sales, processing, machine trades, benchwork,

structural work, and miscellaneous occupational categories than the other education level options. However, many reported that candidates typically had achieved higher levels of education than what was required. In the clerical and sales category, 18 of 25 respondents required a high school diploma or equivalent, and only four respondents required a four-year degree. However, 11 of 26 respondents indicated that candidates typically had a four-year degree. Similarly, in the processing category, 14 of 22 respondents required at least a high school diploma or equivalent. However, 12 of 21 respondents reported that candidates typically had education levels of some college, two-year degrees, four-year degrees, professional degrees or doctorates. Further, 10 of 11 respondents in the machine trades category selected high school diploma or equivalent as a minimum required level of education, 7 of 11 respondents reported that candidates typically had education levels of some college or four-year degrees.

The data indicated more similarities between required and typical levels of education in the service; agricultural, fishery, forestry, and related; benchwork; structural work; and miscellaneous categories. Based on the data, most organizations in the service and agricultural, fishery, forestry, and related occupational categories required at least either a high school diploma or equivalent, or a four-year degree. In the service category, 29 of 72 respondents required at least a high school diploma or equivalent or some college, and 38 of 72 respondents required at least a two- or four-year degree. In the same category, 29 of 75 respondents reported that candidates typically had a high school diploma or equivalent or some college education, and 38 of 75 respondents reported that candidates typically had either a two- or four-year degree. In the agricultural, fishery, forestry, and related category, 20 of 53 respondents required at least a high school diploma or equivalent or some college, and 27 of 53 respondents required at least a two- or four-year degree. In this category, 17 of 54 respondents reported that candidates typically

had a high school diploma or equivalent or some college, and 28 of 54 respondents reported that candidates typically had a two- or four-year degree. Additionally, the majority of respondents in the benchwork, structural work category, and miscellaneous categories required at least a high school diploma, and the majority of respondents in the same categories reported similar typical levels of education achieved. See Table 8.

Table 8

Required and Typical Education Levels of Candidates for Water-Related Positions

Occupational Category		Less than high school f(%)	High school diploma or equivalent f(%)	Some college f(%)	Two-year degree f(%)	Four-year degree f(%)	Professional degree f(%)	Doctorate f(%)
Professional, technical, and managerial	rn=167	0(0.0)	15(9.0)	7(4.2)	3(1.8)	113(67.7)	24(14.4)	5(3.0)
	tn=170	0(0.0)	6(3.5)	8(4.7)	3(1.8)	105(61.8)	41(24.1)	7(4.1)
Clerical and sales	rn=25	0(0.0)	18(72.0)	2(8.0)	1(4.0)	4(16.0)	0(0.0)	0(0.0)
	tn=26	0(0.0)	10(38.5)	4(15.4)	1(3.9)	11(42.3)	0(0.0)	0(0.0)
Service	rn=72	1(1.4)	25(34.7)	4(5.6)	4(5.6)	34(47.2)	4(5.6)	0(0.0)
	tn=75	0(0.0)	13(17.3)	16(21.3)	3(4.0)	35(46.7)	8(10.7)	0(0.0)
Agricultural, fishery, forestry, and related	rn=53	3(5.7)	16(30.2)	4(7.6)	4(7.6)	23(43.4)	2(3.8)	1(1.9)
	tn=54	1(1.9)	12(22.2)	5(9.3)	2(3.7)	26(48.2)	7(13.0)	1(1.9)
Processing	rn=22	0(0.0)	14(63.6)	0(0.0)	3(13.6)	4(18.2)	1(4.6)	0(0.0)
	tn=21	0(0.0)	9(42.9)	4(19.1)	2(9.5)	4(19.1)	1(4.8)	1(4.8)
Machine trades	rn=11	0(0.0)	10(90.9)	0(0.0)	0(0.0)	1(9.1)	0(0.0)	0(0.0)
	tn=11	0(0.0)	4(36.4)	3(27.3)	0(0.0)	4(36.4)	0(0.0)	0(0.0)
Benchwork	rn=4	0(0.0)	4(100.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
	tn=4	0(0.0)	4(100.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Structural work	rn=13	1(7.7)	8(61.5)	0(0.0)	1(7.7)	3(23.1)	0(0.0)	0(0.0)
	tn=13	0(0.0)	8(61.5)	0(0.0)	1(7.7)	2(15.4)	2(15.4)	0(0.0)
Miscellaneous	rn=13	0(0.0)	7(53.9)	1(7.7)	1(7.7)	3(23.1)	1(7.7)	0(0.0)
	tn=14	0(0.0)	6(42.9)	1(7.1)	1(7.1)	5(35.7)	1(7.1)	0(0.0)

Note. rn=required education levels, tn=typical education levels

Skills and characteristics

Participants were asked to rate the level of importance of a list of factors in making hiring decisions for water-related career positions requiring at least a bachelor's degree (see Figure 9). The data indicated a strong emphasis placed on communication skills, personal characteristics and attitude, with more than 98% of respondents rating each of those factors as important or very important. Responses to this question, again, placed greater emphasis on work experience than education, although there was less than an 8% percent difference between respondents' ratings of previous work experience and years of completed education. Additionally, more than 65% of respondents rated "candidate possesses specified degree" and more than 61% of respondents rated "industry-based credentials" as important or very important.

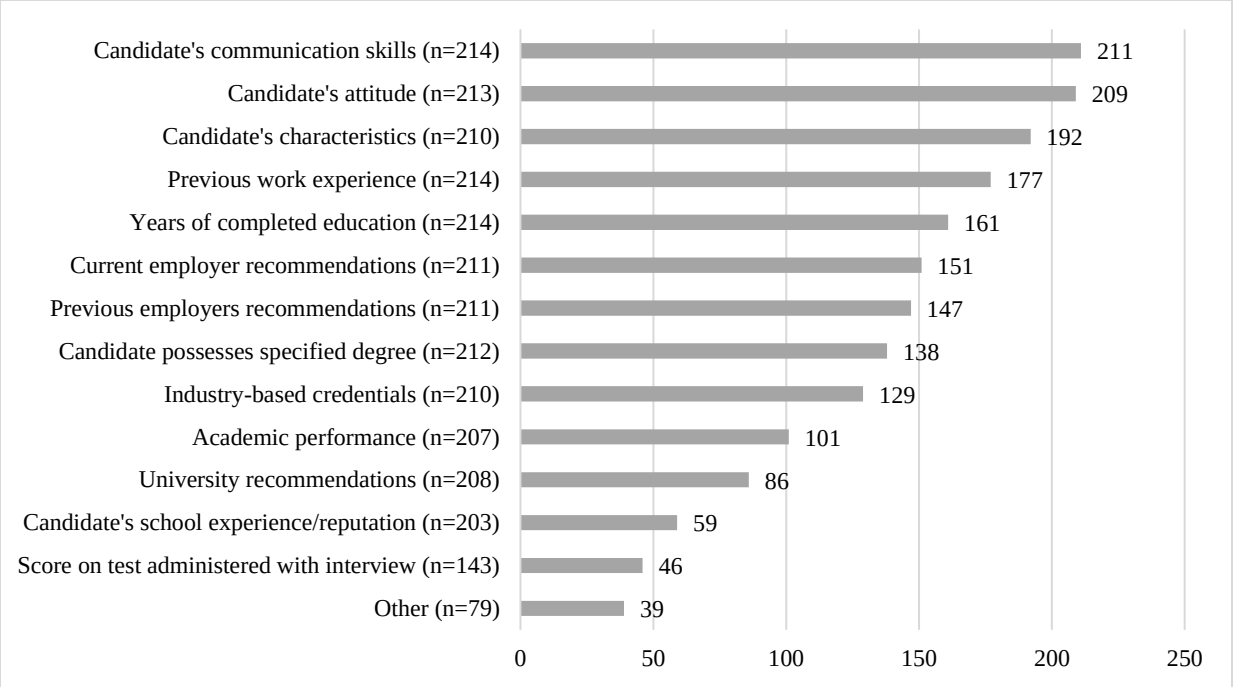

Figure 9. Factors in making hiring decisions for water-related career positions. Respondents ranked each factor on a five-point scale. This figure displays the number of respondents who selected either "important" or "very important."

Those who selected “other” could provide descriptions in an open-text field. Of the 36 responses, descriptions related to work ethic (f=6), technical or water resources-specific knowledge (f=5), experience (f=3), and abilities to work with others or in specified environments (f=4) were most frequently mentioned.

Participants were also asked to rate a list of factors influencing recent decisions not to hire candidates for vacant water-related positions (see Figure 10). The data indicated that the most common factor influencing recent decisions was that candidates did not fulfill necessary requirements. Candidates’ inability to perform interpersonal skills, basic skills required for their positions or technical skills specific to their water-related responsibilities were all rated very similarly, with around 77% of respondents agreeing or strongly agreeing.

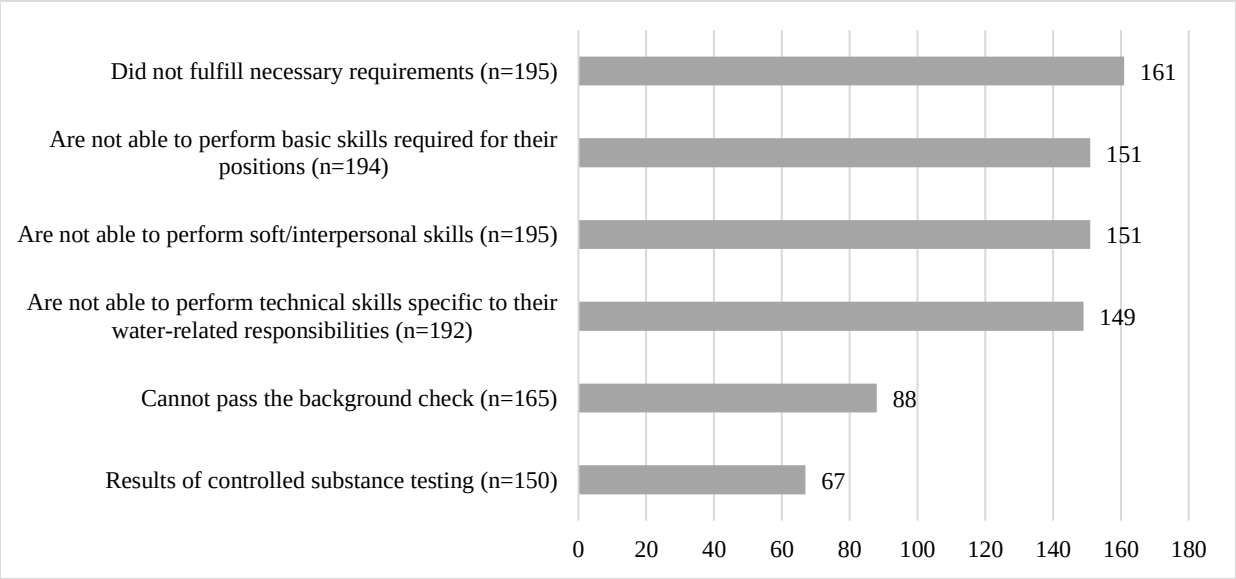

Figure 10. Factors influencing recent decisions not to hire candidates for vacant water-related positions. Respondents ranked each factor on a five-point scale. This figure displays the number of respondents who selected either "agree" or "strongly agree."

Additionally, participants were asked to provide text responses regarding key traits or skills most lacking in candidates for water-related positions. The 141 responses provided an array of traits and skills. There was a variety of soft or interpersonal skills mentioned (f=54), as

well as a variety of technical, job-specific skills mentioned (f=49). “Experience” was a term mentioned particularly frequently (f=47).

Professional development

Participants were asked a series of questions related to professional development opportunities offered to employees in water-related positions, as well as opportunities organizations would utilize if available. When asked whether the organization provides internships, 111 of 211 respondents answered “yes.”

Participants then had an open-text field to provide descriptions of professional development opportunities the respondents’ organizations currently provided for employees in water-related positions. Responses were provided by 164 participants. Common themes among the responses related to opportunities to participate in conferences and seminars (f=94), seek certificates and higher education (f=36), and participate in internal training events (f=49).

In addition to existing professional development opportunities, participants were asked which resources the organizations would utilize, if provided, to offer professional development opportunities for employees in water-related positions (see Figure 11). Of 209 respondents, 164 respondents indicated they would utilize resources provided by universities and extension, 158 respondents indicated they would utilize resources provided by government agencies, 142 respondents indicated they would utilize in-house training and professional development resources, 130 respondents indicated they would utilize private training and professional development resources, and five respondents selected “other.” When asked to rank their selections, “universities/extension” was most often ranked first, “government agencies” was most often ranked second, “private training and professional development” was most often

ranked third, “in-house training and capacity development” was most often ranked fourth, and “other” was most often ranked fifth.

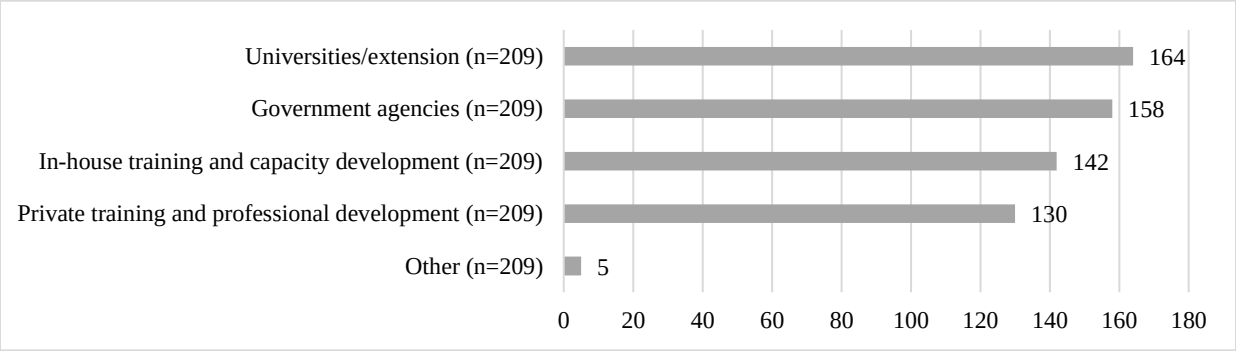

Figure 11. Professional development resources organizations would utilize, if provided. The number on the axis displays the number of respondents who selected the resource.

Organizational growth

When asked for their organizations’ plans for the number of water-related positions in the next three years, 225 participants provided responses (see Figure 12). Of those, 151 respondents indicated their organizations plan to neither increase nor decrease the number of positions, while 63 respondents indicated plans to increase the number of positions and 11 respondents indicated plans to decrease the number of positions.

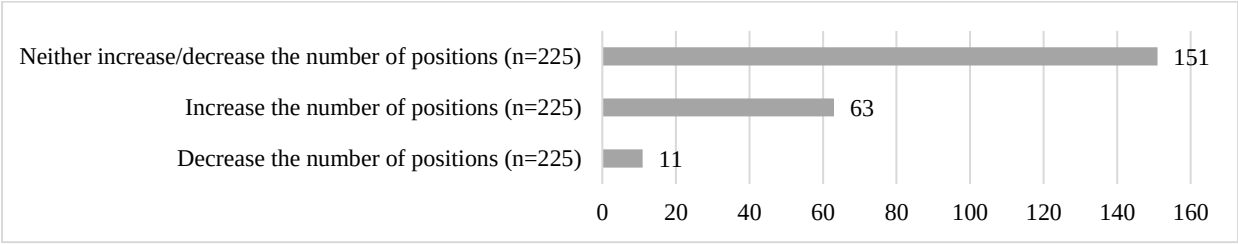

Figure 12. Organizations’ plans for the number of water-related positions in the next three years. The number on the axis displays the number of respondents who selected the item.

When asked to provide lists of constraints that prevent the respondents’ organizations from increasing the number of water-related positions, challenges related to funding and budgets (n=85) and lack of demand (n=16) were mentioned most frequently in 120 total responses.

Additionally, when asked the extent to which participants agreed that **quantity** of graduates in water-related areas was the limiting factor impacting opportunities for organizational growth, 37.3% (84 of 225 respondents) either agreed or strongly agreed, while 21.8% (49 of 225 respondents) either disagreed or strongly disagreed. When asked the extent to which participants agreed that **quality** of graduates in water-related areas was the limiting factor impacting opportunities for organizational growth, 45.7% (103 of 225 respondents) either agreed or strongly agreed, while 16.4% (37 of 225 respondents) either disagreed or strongly disagreed.

Increasing the number of positions

Of 63 respondents whose organizations expected to increase the number of positions in the next three years, 24 respondents expected to increase the number of positions within the next 12 months. Another 21 respondents expected to increase the number of positions in the next one to two years, while 16 respondents expected to increase the number of positions after at least two years. Participants then had an open-text field to provide factors influencing the organizations' decisions to increase the number of water-related positions. Two themes emerged from 53 responses related to increased demand for the organizations' services (f=37) and increased availability of funding (f=13). See Table 9.

Table 9

Organizations' Planned Timelines for Increasing the Number of Water-Related Positions

Plan	Within 12 months f(%)	Between one and two years f(%)	Between two and three years f(%)	More than three years f(%)
Increase the number of positions (n=63)	24(38.1)	21(33.3)	14(22.2)	2(3.2)

When asked by how many positions the organizations expect to increase, the majority of respondents in the professional, technical, and managerial; clerical and sales; service; agricultural, fishery, forestry, and related; processing; structural work; and miscellaneous

occupational categories indicated expectations to increase by one to three positions. Those in the benchwork category indicated expectations to increase by either one to three positions or four to six positions. Additionally, six of 49 respondents in the professional, technical, and managerial category indicated expectations to increase by more than 10 positions. See Table 10.

Table 10

Organizations' Planned Increased Number of Water-Related Positions

Occupational Category	1-3 positions f(%)	4-6 positions f(%)	7-9 positions f(%)	10+ positions f(%)
Professional, technical, and managerial (n=49)	40(81.6)	2(4.1)	1(2.0)	6(12.2)
Clerical and sales (n=7)	7(100.0)	0(0.0)	0(0.0)	0(0.0)
Service (n=22)	16(72.7)	2(9.1)	2(9.1)	2(9.1)
Agricultural, fishery, forestry, and related (n=13)	8(61.5)	2(15.4)	2(15.4)	1(7.7)
Processing (n=7)	4(57.1)	2(28.6)	1(14.3)	0(0.0)
Machine trades (n=4)	3(75.0)	0(0.0)	1(25.0)	0(0.0)
Benchwork (n=2)	1(50.0)	1(50.0)	0(0.0)	0(0.0)
Structural work (n=3)	3(100.0)	0(0.0)	0(0.0)	0(0.0)
Miscellaneous (n=2)	2(100.0)	0(0.0)	0(0.0)	0(0.0)

Decreasing the number of positions

Of 11 respondents whose organizations expected to decrease the number of positions, five respondents expected to decrease the number of positions within the next 12 months. Another two respondents expected to decrease the number of positions in the next one to two years, while four respondents expected to decrease the number of positions after at least two years. Participants then had an open-text field to provide factors influencing the organizations' decisions to decrease the number of water-related positions. The nine total responses were related to budget or financial challenges (f=7), decreased need for employees due to technological advancements (f=1), and management decisions (f=2). See Table 11.

Table 11

Organizations' Planned Timelines for Decreasing the Number of Water-Related Positions

Plan	Within 12 months f(%)	Between one and two years f(%)	Between two and three years f(%)	More than three years f(%)
Decrease the number of positions (n=11)	5(45.5)	2(18.2)	3(27.3)	1(9.1)

When asked the number of positions by which organizations expect to decrease, the majority of respondents in the professional, technical, and managerial; clerical and sales; service; agricultural, fishery, forestry, and related; and structural work occupational categories indicated expectations to decrease by one to three positions. Additionally, one of nine respondents in the professional, technical, and managerial category indicated expectations to decrease by four to six positions. See Table 12.

Table 12

Organizations' Planned Decreased Number of Water-Related Positions

Occupational Category	1-3 positions f(%)	4-6 positions f(%)	7-9 positions f(%)	10+ positions f(%)
Professional, technical, and managerial (n=9)	8(88.9)	1(11.1)	0(0.0)	0(0.0)
Clerical and sales (n=1)	1(100.0)	0(0.0)	0(0.0)	0(0.0)
Service (n=1)	1(100.0)	0(0.0)	0(0.0)	0(0.0)
Agricultural, fishery, forestry, and related (n=1)	1(100.0)	0(0.0)	0(0.0)	0(0.0)
Processing (n=0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Machine trades (n=0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Benchwork (n=0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Structural work (n=1)	1(100.0)	0(0.0)	0(0.0)	0(0.0)
Miscellaneous (n=0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)

Interview results

The researchers conducted 12 interviews, each of which lasted approximately 20 to 30 minutes. Participants included one representative from the public sector and one representative from the private sector from each of the following water-use categories – industrial, irrigation, law, municipal, recreation and conservation, and stockwater (see Table 13). The participants represented various locations across Kansas, with four participants in the south central region, five participants from the northeast region, and three participants from the southwest region. Participants were given pseudonyms to ensure anonymity.

Audrey and Ben represented the industrial category. Audrey founded an environmental consulting agency that provides consulting services to help industry meet environmental and

safety compliance, and Audrey is responsible for management and leadership. Ben manages a chemical plant, which implemented water conservation technology to reduce waste.

Craig and Doug represented the irrigation category in the study. Craig directs public policy, focusing on water resources, for an agricultural advocacy organization. Craig serves as a resource to irrigators and represents them in advocacy efforts. Doug's family owns a that sells and services irrigation equipment. Doug works closely with new experienced employees, and had recently been working to increase the business's focus on internal professional development.

Elizabeth and Fletcher represented the legal category. Elizabeth works in academia, preparing undergraduate students for law school. She works closely with a variety of legal programs, as well as students interested in pursuing legal careers. Fletcher is a partner in a law firm that works closely with irrigators statewide. Fletcher focuses efforts primarily on lobbying.

Greg and Henry represented the municipal category in the study. Greg has a director role in an organization that represents municipal utilities across the state. He works closely with municipal utility operators across the state. Henry is an environmental engineer, with expertise in designing environmental solutions. He provides leadership for a branch of the firm.

Ian and Josh represent the recreation and conservation category. Ian works in water resources planning for an agency, following a previous role as a fisheries biologist in the public sector. Josh directs statewide efforts focused on conservation for a global organization. He leads the state's office of organization, which hires scientists and works closely with a variety of partners.

Kevin and Luke represent the stockwater and waste category in the study. Kevin is an environmental engineer who provides leadership for an environmental consulting organization. The organization focuses efforts on designing solutions for livestock operations. Luke manages a

large feedlot, which focuses many efforts on conserving water resources and protecting water quality, and Luke plays a major role in decisions related to those efforts, including staffing.

Table 13

Participant Names and Water-Use Categories

Participant	Water-Use Category
Audrey	Industrial
Ben	Industrial
Craig	Irrigation
Doug	Irrigation
Elizabeth	Legal
Fletcher	Legal
Greg	Municipal
Henry	Municipal
Ian	Recreation and conservation
Josh	Recreation and conservation
Kevin	Stockwater and waste
Luke	Stockwater and waste

The following results incorporate responses from all 12 participants. The qualitative data is presented in the order by which questions were asked, beginning with the first question.

Desired abilities and characteristics

Participants were first asked to discuss the abilities and characteristics that best describe ideal applicants for their organizations' water-related positions. They responded with a range of abilities and characteristics. See Table 14.

Table 14

Ability Requirements

Theme	Sub-Theme	Category
Ability requirements	Desired knowledge of science and engineering	Geology Biology Engineering Hydrology Environmental science Chemical engineering Piping systems and pumps Environmental protection systems Safety shutdown systems Natural resources Environmental studies Environmental law Fluvial geomorphology Biological and chemical attributes of streams Water resources Surface water resources engineering Groundwater resources engineering
	Desired knowledge of the water system	Kansas water system Regulations Regulatory compliance Kansas water law and regulations Water rights
	Desired employability skills	Self-motivation Asking questions Communication skills Developing relationships Thinking clearly Listening Communicating with agricultural producers Speaking languages of constituents Continuing to learn Broad knowledge areas Versatility in knowledge and skills Deep knowledge Analytical skills Mechanical skills Troubleshooting Problem solving

Knowledge of science and engineering

Audrey, Ben, Elizabeth, and Josh all mentioned specific knowledge areas of science and engineering. Audrey stated, “For water-related things, geology, for us, is prime. Biology can fit also for some of the things. And then, of course, engineering is going to be required for some of the projects.” Audrey also mentioned the importance of understanding hydrology. For Ben, “Typically, they would have a degree in environmental science. We have some with degrees in biology, and then we have a range of chemical engineers that are involved with that.” Ben further listed specific areas of knowledge desired by the organization, and indicated a preference for candidates who understand “piping systems and pumps,” “environmental protection systems” and “safety shutdown systems.” Elizabeth indicated that the organization looks for both “an indication of interest” and “some preparation” in the areas of geology, natural resources, environmental studies or environmental law. Josh stated, “We’re looking for people who understand hydrology and, in the case of streams, which is what we’re most interested in, fluvial geomorphology.” Josh also added that ideal candidates have an understanding of “the biological and chemical attributes of healthy and unhealthy streams.” Kevin noted that the characteristics of ideal applicants vary by position in the organization, stating that the organization has “some that would require a fairly intensive background in water resources, others, a more general knowledge.” Kevin indicated that those requiring a more intensive background on the topic would ideally have “specific coursework and training and background in water resources engineering – both surface and groundwater.”

Knowledge of the water system

Participants also noted the importance of understanding the water system. Ben, Craig, Kevin and Luke mentioned particular knowledge of the Kansas water system or related

regulations. Ben indicated an emphasis on regulatory compliance, stating, “They need to have an understanding of the importance of regulatory compliance and all of the documentation that’s associated with documenting how much water we use, how much we dispose of – all of those systems.” Luke also indicated an importance placed on a candidate’s ability to help the organization follow “Kansas water law and regulations.” Kevin mentioned a similar emphasis on regulatory compliance, but in the context of helping clients remain in compliance with water law and regulations. Craig noted an importance of candidates “understanding the complexities of our water systems in Kansas, from the hydrology and geology to the water right and water law aspects.”

Employability skills

Some participants noted not only technical knowledge and ability areas, but employability skill areas as well. Craig, Doug, Elizabeth, Fletcher, Henry, Ian and Josh noted the importance of a variety of such skills. Doug mentioned both self-motivation and the ability to ask questions as characteristics describing an ideal candidate. Craig listed communication skills and the ability to develop relationships as important characteristics. Elizabeth also mentioned communication skills, as well as the ability to think clearly. Henry further explained that the candidate should be able to not only convey thoughts to clients, but listen as well. Fletcher and Josh both mentioned that the communication and interpersonal skills must allow the candidate to relate technical information to others. Fletcher indicated a preference for candidates with agricultural backgrounds so they have the “ability to communicate with [agricultural] producers.” Josh stated, “They have to speak several languages. They have to speak rancher, they have to speak farmer, they have to speak biologist, they have to speak political leader and political activist.”

Craig, Doug, Elizabeth, Greg, Ian and Luke mentioned the breadth, depth and/or continued growth of candidates' knowledge. Craig, Doug and Ian indicated that it would be important for candidates to be willing and able to continue developing knowledge, either related specifically to the position or to new technologies. Greg placed emphasis on candidates having knowledge "in a lot of areas," and Luke described an ideal candidate as "versatile" in their knowledge and skill areas. Elizabeth also mentioned the breadth of knowledge, but stated the organization looks for "depth of knowledge" as well.

Finally, Ben placed an emphasis on industry experience for some positions in the organization. Henry mentioned that an ideal candidate would have passion for their chosen field, stating, "Somebody can't really be successful – or it's not very often that somebody's successful – if they are really good at something they don't really like doing." Luke mentioned analytical and mechanical skills can help equip a candidate to troubleshoot and problem solve in the position.

Abilities typically demonstrated upon hire

Participants were then asked to consider which abilities applicants typically demonstrate upon hire, whether required or not. See Table 15.

Table 15

Typical Ability Sets

Theme	Sub-Theme	Category
Typical employee ability sets demonstrated upon hire	Typical technical knowledge and abilities	Understanding of water policy and water law Basic understanding of technical needs
	Typical employability skills	Good computer skills Communication skills Troubleshooting
	Typical qualifications	Education Experience

The abilities participants noticed that job applicants typically demonstrate well upon hire varied greatly across organizations represented in the study's sample. Ben indicated that applicants typically demonstrate good computer skills. Craig suggested that for applicants, "some education or experience probably has to be demonstrated just to get in the door." Fletcher mentioned that applicants typically demonstrate communication skills and "a basic understanding of water policy and water law," but indicated that applicants would have to possess such abilities or they would not be hired for the position. Greg stated that applicants typically demonstrate the ability to troubleshoot. Ian mentioned "common courtesy" as a typical ability. Finally, Josh and Kevin indicated that applicants can typically demonstrate at least a basic understanding of the technical needs of the positions.

Typical ability gaps

Participants were then asked to transition from abilities demonstrated to abilities lacking, and were asked to recall ability gaps typically observed in applicants for water-related positions. See Table 16.

Table 16

Typical Ability Gaps

Theme	Sub-Theme	Category
Typical employee ability gaps demonstrated upon hire	Typical lack of experience	Mechanical aptitude Exposure to big water pumps and piping systems Implementation of design plans Troubleshooting Problem solving skills Knowledge of nuances of the business Relationships with customers Social networks Client-specific procedures
	Typical lack of knowledge	Breadth of knowledge related to water Depth of knowledge related to water Knowledge of political water issues Knowledge of Kansas water law Exposure to computer-aided drafting
	Typical lack of employability skills	Communication skills Scientific writing skills Study skills

Lack of experience

When asked about typical ability gaps observed in job applicants for water-related positions, Ben, Craig, Doug, Henry, Josh, Kevin and Luke attributed a variety of ability gaps to lack of experience. Ben listed "mechanical aptitude" as an ability gap, and specifically mentioned that applicants typically lack "exposure to big water pumps and piping systems." Henry indicated that practical experience is typically what teaches an employee to "transition from a design or planning to actually putting it in the ground." Luke stated that the "troubleshooting and problem solving skills" that the organization needs typically come from experience. Participants Doug, Josh and Kevin attributed ability gaps specific to building relationships and meeting the needs of clients or others to lack of experience with their organizations. Doug stated that "knowledge of the nuances in the business" and "relationships with the customers and getting to know them and know what their needs are and their values" are

areas in which applicants lack abilities upon hire. Josh mentioned that through experience comes larger networks, stating, “It’s not knowing who the other stakeholders are… then, if they don’t know who they are, then they probably also don’t know how to speak their language.” Kevin noted that some clients have specific procedures employees must follow, and new hires do not immediately know those procedures.

Lack of knowledge

Audrey, Elizabeth, Fletcher and Kevin presented gaps related to applicants’ knowledge. Elizabeth stated,

> In some ways, [water law] is more related to oil and gas than just agriculture. Agriculture is just one of the million uses of it. So, I think sometimes there’s not a clear understanding of the breadth and the limitations of the knowledge. And, also, sometimes I think there hasn’t been enough depth of knowledge in the specific area.

Audrey mentioned a gap in applicants’ understanding of the politics surrounding water issues. Similarly, Fletcher stated,

> I would say the biggest gap would be the knowledge of the formula – or the framework, I should say – of Kansas water law…There are a lot of water policy discussions going on right now… they aren’t aware of the dynamics of the discussion that’s going on, and it is very dynamic.

Kevin cited a gap in a specific knowledge area, noting that, “It would be helpful if there was more exposure to computer-aided drafting – CAD – at the undergraduate level.”

Lack of employability skills

Audrey and Ian focused on ability gaps related to communication. Ian specifically noted poor communication skills, while Audrey noted poor scientific writing skills. Audrey provided the following example:

> If you’re out in the field and you’re sampling wells or you’re sampling soil, or you’re doing an evaluation of some kind of wetlands or something like that, you

> know, you've got to be able to take good field notes. Those generally later appear in a report.

Greg focused on an inability to study for certification exams. He stated,

> They have to pass certification exams, and a lot of them have just been out of the business or out of school for so long, they can't study. You give them all the kinds of reading materials, and it's 'Well, I'm too old to read now.' But, that ability to really study and pass that certification exam, because some communities, if they don't have it within a year, they're trying to find a new person that can take that exam.

Expected ability changes

By this point in the interviews, participants had discussed skills and characteristics desired, typically demonstrated and typically lacking. Next, participants were asked how they see the abilities needed for employees in water-related positions changing over the next 10 years. See Table 17.

Table 17

Expected Changes in Ability Requirements

Theme	Sub-Theme	Category
Expected changes in ability requirements	Technology	Use of tablets to record field notes
		Adapting quickly to technology changes
		Technological changes for water systems
		Ability to troubleshoot for technology
		Adapting to technology that is difficult to anticipate
		Applying new technology to clients' needs
		Including technology changes in curriculum
		Technology for eliminating waste and reusing resources
		Technology becoming more affordable in the future
		Increased focus on conservation through technology
		Implementation of industrial design standards
	Policies and regulation	Understanding the "why" related to water policy
		Historical perspective of water law
		Greater appreciation and understanding of state's water laws
		Willingness of attorneys to litigate
		Complex abilities related to water law
		Specialized knowledge
	Education	Education of general society
		Defining and implementing best practices
	Collaboration	Communicating with other organizations and industries

Technology

Audrey, Doug, Greg, Henry, Ian, Josh, Kevin and Luke mentioned the impact of technological change on job expectations. Audrey specifically noted the use of tablets to record field notes, stating, "They are going to expect them to utilize technology – being ready, able and willing to utilize technology, because if we can utilize technology in the right way, it will cut back on required support staff when they come back to the office." Doug stated, "When technology changes, the need to know and the need to learn is just exuberant. You've got to learn fast and be willing to change with the culture as it changes." Greg related technological change to the practices of municipality operators, and stated,

> The technology has really changed quite a bit in the last five years, and I see a lot more changing for operators. Some of them can run their water plant with their

> smart phone; they can turn on and off pumps and not even have to be at the plant. More technology, and I'm going to say will even open more jobs in troubleshooting that technology.

Henry also recalled recent technological changes, and anticipated the trend continuing, while also noting that what the technological changes might be can be difficult to anticipate. Henry stated, "What I've seen in the past 10 years probably translates to the next 10 years, and that's technology – being able to adapt to new technology and run with it, and figure out how to apply it to meet those client needs." Kevin stated,

> Water resources technology will change and just increase in its capabilities and accuracies. So, we would hope that the educational system would include those changes in their curriculums and just be able to better prepare students to become full-time employees.

Luke discussed technology's role in finding ways to eliminate waste and reuse resources, and indicated that affordability of technology is a factor. He stated,

> Technology is there to do that, but right now, it's just not affordable to be able to do it. But, when it becomes affordable, I think we may need to hire people and have experience in biological systems and maintaining… a live system.

Ben also noted changes in technology impacting ability needs as organizations are better able to adapt, noting the organization's recent investment in technologies to reuse water. Ben anticipated an increased focus on managing the organization's water systems with a greater emphasis on conservation, and stated, "We're a very large water consumer… This plant's been around for a long time. We're just at that edge where, even though it may not be financially justifiable, it's the right thing to do." He suggested that there should be design standards to assist organizations in implementing technologies for beneficial reuse of water, so that "each company doesn't have to reinvent the wheel." As mentioned previously, Ben manages a chemical plant in south central Kansas.

Josh related changing technology to an increased need to communicate with different water users. He discussed the agricultural technology changes that impact stream quality, and stated,

> [Organization] has never really worked in Kansas with tillage production agriculture. We've always worked on the grazing side. That's going to change. If we're going to do good things for streams, some of it's going to happen in partnership with tillage agriculture.

Policies and regulations

Audrey, Craig, Elizabeth and Fletcher noted expected needs to increase employees' knowledge of water policy and regulations as they continually change. Audrey stated,

> I really think they have to understand the 'why' of some of the situations, and that's going to have a historical perspective on water law. You know, I would expect them to know and understand something about water policy, and there's a lot of things even heard to municipal water supply, that having an awareness of how decisions are made for rates and the things that factor into that.

Craig stated,

> You about have to have a lawyer with you everywhere you go, you know? I'm afraid that there's probably little getting around the legal aspects of dealing with water quantity and quality concerns… I think one thing that always is going to be needed is not necessarily more lawyers, but just a greater appreciation and understanding of our water laws across our state.

Craig later stated, "I would say anybody who wants to get into this field regardless of what positions they're taking needs a basic understanding of our water law." Fletcher mentioned an increased focus on water law, and stated, "I think there will be greater need for attorneys that understand water law and that are willing to litigate… I think litigation's inevitable as water becomes more valuable." Elizabeth indicated that abilities related to water law will become "much more complex" as regulation of water has increased. Elizabeth stated,

> I think the ability to understand all of the ramifications of the regulations, the legislation. I think that's going to be critically important because with water, you have to worry about what Nebraska and North Dakota are doing. It's not just within the borders of Kansas. So, there's a lot of interrelationship between jurisdictional areas. I think it's going to take much more expertise than it has in the past.

Elizabeth also noted that the increased complexity in abilities needed is likely to require "more specialized knowledge on the front end."

Education

Craig and Luke also anticipated future employees will need to espouse an increased focus on education of general society. Craig stated, "When we understand our water supplies, and our water challenges, and the legal framework under which it operates, then I think society as a whole will benefit from that." Luke mentioned a focus in the feedlot industry on defining best practices related to water resources, and finding ways to measure increases in the use of best practices. Luke noted that it is an effort to better educate both feedlot operators and society, and improve public image.

Collaboration

Josh discussed increasing the conversation between conservation and urban water supplies, stating, "We're going to have to begin to figure out how what we do impacts urban water supplies, and how those constituencies can be partners for us. That's an immediate change that's coming."

Existing professional development opportunities

Participants were then asked about professional development opportunities currently provided for employees in water-related positions. Responses indicated that organizations utilize both internal and external professional development resources. See Table 18.

Table 18

Existing Professional Development Opportunities

Theme	Sub-Theme	Category
Existing professional development opportunities	Internal professional development opportunities	Internal training program for first year of employment Off-site exercises Purpose and values professional development initiative Invitation for speakers and panels Regulatory compliance "refreshers" Management training Internal job shadowing Internal online technical courses Internal online social courses Participation in organization-wide initiatives Monthly trainings on safety (and occasionally, environmental) topics Meetings with water law discussions
	External professional development opportunities	Tuition assistance Cost-share opportunities for education Attendance at meetings, conferences, seminars, and/or workshops Technical certification courses Parts or service schools Water law program

Internal professional development opportunities

Ben, Doug, Elizabeth, Greg, Henry, Josh and Luke listed a variety of internal resources used. Ben, Doug and Luke described regular internal training programs required of all employees. Ben described an "extensive and regimented training program," particularly for an employee's first year of employment, as well as some off-site exercises. Doug described a new internal professional development initiative focused on helping employees recognize how their personal purposes align to the organization's purpose and values. Luke described monthly internal trainings that take place, which typically focus on safety topics, but incorporate environmental topics a couple of times each year. He also described internal meetings, in which discussions related to current topics in water law might take place.

Elizabeth, Greg and Josh described internal training opportunities that are made available, but did not indicate that they were required or necessarily regular. Elizabeth indicated that the organization invites speakers and panels to the organization. Greg mentioned internal "refresher" trainings focused on staying in compliance with regulations, as well as management training for those seeking opportunities to advance to management roles in the organization. Josh noted that employees have opportunities to participate in the organization's "global and continental water initiatives" that present opportunities to learn about water systems in other locations.

Finally, Henry and Josh discussed assortments of internal training courses readily available to employees whenever employees need them. Henry added that the organization provides opportunities for new employees to job shadow those with more experience. Josh added that the organization's online courses incorporate both "technical" and "social" topics.

External professional development opportunities

Audrey, Ben, Craig, Doug, Elizabeth, Henry, Ian and Kevin described external resources they utilize to provide professional development opportunities for employees. Audrey mentioned that the organization provides tuition assistance. Similarly, Henry also highlighted cost-share opportunities for education. Ben, Craig, Henry and Ian mentioned that employees have opportunities to attend external training opportunities including meetings, conferences, seminars and/or workshops. Ben and Kevin discussed courses to earn technical certifications, and Kevin mentioned that the organization provides related study materials and review sessions as needed to help employees pursue those certifications.

Doug and Elizabeth mentioned specific focus areas for external professional development opportunities. Doug noted that employees might attend training experiences provided by specific

brands or areas of industry, focused on particular parts or services. Elizabeth noted that the new water law program at Washburn University provides professional development for law students specifically focused on water resources.

Ability sets for which to train internally

After discussing professional development opportunities already in existence, participants were asked to think more specifically on the abilities for which to train. Participants first described the abilities for which the organization would prefer to train employees internally. See Table 19.

Table 19

Ability Sets for Internal Training

Theme	Sub-Theme	Category
Ability sets for which to train internally	Employability skills	Teamwork Organization skills Communication skills Interpersonal skills Interactions with stakeholders
	Job-specific skills	Sampling techniques Organization-specific services Organization's design standards Organization's administrative processes Hydrologic methods used by the organization CAD program used by the organization Internal procedures used for day-to-day operations Water-specific knowledge that the employee lacks Mechanical abilities
	Regulatory requirements	Regulatory requirements Compliance with regulations

Employability skills

Craig, Fletcher and Josh indicated that they would prefer to train employees on employability skills internally. Craig stated, "We have classes occasionally here within the

organization that helps to develop everything from teamwork to just being organized, and things like that." Fletcher referred to communication skills, and stated, "We represent a lot of dairies and feedyards in western Kansas, and irrigators, and that's what I would say. The ability to communicate with producers is what we would handle internally." Josh thought the organization was better equipped to train employees on interpersonal skills, and stated, "Because of the organic training opportunities, you know, opportunities to work in different geographies and different programs, maybe we do better on the stakeholders and human skills side internally." Fletcher and Josh seemed to describe opportunities to train for such skills as on-the-job training.

Job-specific skills

Audrey, Doug, Henry, Ian, Kevin and Luke indicated that they would prefer to train employees on job specific skills internally. Audrey discussed sampling techniques and indicated that the organization already provides training related to the topic, stating,

> We're certainly capable of training people in sampling techniques, and we do so. There are different ways to sample wastewater discharge, and training people to permit requirements – I mean, they're all unique. Each program's a little bit unique, but a lot of similarities.

Doug thought the specific services the organization provides to customers are best taught in the field, rather than a classroom. Doug stated, "Fixing these center pivots, you know, you can be book smart all you want, but until you get out there and twist the wrench, you're probably not going to get it." Henry referred to the organization's design standards and administrative processes of delivering projects. Henry stated,

> Part of it is just how we run our projects, and how you document and do the admin part of delivering a project… From the other side of it, too, is the technical design part of it. I mean, we have certain standards that we want to meet. So, those are some of the things that we would focus on internally.

Kevin also mentioned the technical aspects of design work as an area of training offered internally. Kevin stated, "For the engineers, unless curriculums change quite a bit, we would specifically train them on hydrologic methods that we use in our water resources design and analysis work and the CAD (computer-aided drafting) program we use." Ian referred to internal procedures that would be used for day-to-day operations. Luke discussed how internal training needs are often determined by the individual, and stated, "There is some education, if a person doesn't have that knowledge coming in, [on] just how a water well works, and what the pump looks like, and how to maintain those wells mechanically." Luke also mentioned that the mechanical abilities are primarily taught through on-the-job training.

Regulatory requirements

Craig, Greg, Kevin and Luke indicated that they would prefer to train employees on regulatory requirements internally. Craig used water law as an example.

> I think that would be the more technical, specific-type of training and classes. We've had – well, in fact, I know we host occasionally – law. Attorneys come in and we will have speakers talk about a wide variety of topics, but some of those are specifically for water and water law.

Greg mentioned that some employees are more likely to accept regulations if they are shared by someone internally. He said,

> For water systems, a lot of internal [training] is going to be more of the regulations, because some of the seasoned operators don't like rules. They're against any type of government saying, "You have to do this." "Why do we have to do that?" That should be more internal, and not on them.

Kevin referred to an observed lack in resources preparing employees to meet regulatory requirements, and stated,

> One of the things that drives a lot of what we do is regulatory requirements. A portion of the regulatory requirements are technically based. I'm not aware of any curriculum that really teaches that part, so that's something that has to learned kind of on-the-job- and in-house.

Luke indicated that most of the organization's existing internal training specific to water resources is focused on compliance with regulations.

Ability sets for which to train externally

Participants were then asked to transition from focusing on abilities for which to training internally, to those for which to train externally. They described abilities for which their organizations would prefer external sources provide training. See Table 20.

Table 20

Ability Sets for External Training

Theme	Sub-Theme	Category
Ability sets for which to train externally	Job-specific skills	Hydrology Engineering Regulatory requirements Water law Sales Law school Special projects or knowledge areas Technical training
	New technology	New equipment (such as water meters) New technology (such as drone technology) New methods, procedures and computer programs New technology the organization lacks internal training for Water well pressures, line pressures and delivery systems design

Job-specific skills

Audrey, Craig, Doug, Fletcher, Ian, Josh, Kevin and Luke indicated that they would prefer external sources provide training for employees on specific technical skills. Audrey discussed abilities related to hydrology and engineering.

> I'm not going to teach a course in hydrology. I think I aced that course, but it doesn't make me feel like I want to teach it, and I've probably forgotten too much of it to be good at it… Anything tied to engineering or to hydrology, we just wouldn't do that. There are people much better qualified to do that than us.

Ben discussed regulatory requirements, and stated, “There are conferences on all of the regulations associated with underground injection control wells and all of that sort of stuff. So, we send people to that.” For Doug, the technical skills mentioned were related to sales. Fletcher noted that there is an expectation that law school will adequately prepare students in specific areas entering the legal field. Ian referred to “special projects or areas that the [organization] has no institutional knowledge of.” He said, “I guess there is a comfort area, so if it is outside of that, [where] they don’t feel they have somebody [who] is able to do that, they bring [external resources] in.”

Josh, Kevin and Luke indicated they would utilize external resources for technical training if those resources were available. Josh said, “I think I would prefer to see us be really good at training people on the cultural and human skills, and get the technical training from universities or places where technical training arises. That would be my preference.” Kevin noted that additional external training resources would be utilized if available, and stated, “I think we certainly would take advantage of external sources if they could provide some of the training for some of the more unique things we do – for the things that we perhaps do in-house now because there are no alternatives.” Luke also mentioned a lack of existing resources, and stated, “I’ll tell you, we just haven’t come across a whole lot of external training opportunities in that [water resources] field.”

New technology

Greg, Henry, Kevin and Luke indicated that they would prefer external sources provide training for employees on new technologies. Greg discussed utilizing external sources to train employees on the newer equipment the organization uses.

> I’m going to use smart meters as an example. Every company is a little bit different, but the guys need to understand how they work, so I’d say pull in those

> industry experts to do the training on their specific item. We have a tough balance to do that, because a lot of it ends up being it seems like a sales pitch. The company guy comes in, and he's talking about his meter. Well, all meters are pretty close to the same – the way they operate. It's the way the technology is.

Henry used drone technology as an example, and stated, "One thing we're looking at right now is drone technology – what could be done with drones to look at river systems, aquifers, health of watersheds. So, that's kind of an external process." Kevin stated, "Probably wherever there are advances in technology – new methods, new procedures, new computer programs – we would certainly take advantage of external sources to get our employees in the initial training that they need." Luke noted that the organization is "kind of learning as we're going," and therefore "[don't] really have training developed yet that would say, 'Okay, now here's how the system works,'" in regard to new technology. Luke listed water well pressures, line pressures and delivery systems design as examples of technologies for which external training sources would be utilized.

Reinforcing the importance of professional development

In addition to the professional development opportunities themselves, participants were asked what their organizations do to reinforce the importance of professional development once the employee is in the workplace. See Table 21.

Table 21

Existing Reinforcer Systems

Theme	Sub-Theme	Category
Existing reinforcer systems	Established expectations	Fundamental expectation for employee growth Expectation for excellence Internal communication Internal collaboration Internal discussion of opportunities Professional development plans Advancement based on maintaining technical certifications
	Acknowledged efforts	Performance rewards Celebrations of achievement
	Financial support	Financial support for technical certifications Financial support for conferences, training and continuing education Financial support for licenses Tuition reimbursement

Established expectations

Ben, Doug, Fletcher, Henry and Josh described their organizations' efforts to set expectations and create workplace environments that encourage employees to seek professional development. Ben described a "fundamental expectation that employees are responsible for their career, and they are responsible for their own growth." Doug stated, "You keep raising that bar and you expect excellence out of your employees and yourself, and that's something that [the organization] has always prided itself in."

Fletcher indicated that the employees within the organization encourage each other's professional development through an "open line of communication" that "challenge[s] each other's thinking." Henry also described an atmosphere in which internal collaboration is fostered, and said, "I think it's more fostering an atmosphere or a culture where everybody wants to try to advance their career – advance their knowledge." Henry indicated that internal discussion among employees about professional development opportunities encourages others to seek those

opportunities. Josh described the organization's requirement for each employee to have a professional development plan, and indicated that the plan is not necessarily about advancing within the organization, but about "put[ting] some emphasis on just professional development planning and being purposeful about it."

Kevin referred to expectations that employees should seek professional development if they which to advance in the organization. He discussed opportunities for employees to advance in their careers due to professional development. Kevin stated, "To some degree, advancement in our organization is based on maintaining technical certifications."

Acknowledged efforts

Ben, Greg and Ian discussed efforts by the organizations to help employees feel rewarded for their commitments to professional development. Ben noted "performance rewards" to "reward people for exceptional work." Greg also said the organization tries to "celebrate their achievement" by highlighting employees' professional development achievements in internal publications, providing gifts and printing certificates. Ian also said that the organization encourages employees to seek professional development by asking them to put their new abilities to use.

Financial support

Audrey, Craig, Ian, Kevin and Luke indicated that their organizations offer financial support for employees to seek professional development, and that serves as reinforcement. Both Audrey and Ben described the importance of employees maintaining technical certifications, and indicated that their organizations support those efforts financially. Audrey stated, "Certifications are critical to our line of business, and we pay for any of their conferences or continuing ed type of courses that they need. We pay for their licenses. That's on my dime, on my time, and

everything." Audrey also referred to tuition reimbursement opportunities. Craig said, "There is financial support for professional development, so it's not the responsibility so much of the employee." Ian described the organization's willingness to support individual employees' desire to attend training opportunities. Luke indicated that the organization offers tuition reimbursement "if there was something related to that field that they wanted to go do it." However, Luke also indicated that tuition reimbursement has not been used much for water resources-related opportunities, because the organization has not identified many external training opportunities in that field.

Employee evaluation

Participants were then asked about their organizations' processes for continually evaluating the employee's abilities to meet the needs of the position. See Table 22.

Table 22

Existing Methods of Measuring Correspondence

Theme	Sub-Theme	Category
Existing methods of measuring correspondence	Formal evaluation	Regular annual performance reviews Regular semi-annual performance reviews Peer reviews, written tests, verbal exams and a field demonstration for new employees Process with "self-appraisal" and supervisor review
	Performance measures	Peer and supervisor reviews of client deliverables Performance on projects Feedback from clients Tailor training to client needs Performance of organization's overall programs
	Internal communication	Internal communication Day-to-day interaction Staff meetings

Formal evaluation

Ben, Doug, Henry, Ian, Josh and Luke described formal review and evaluation processes conducted by the organization. They indicated that their organizations conduct regular, either

annual or semi-annual performance reviews. Ben added that new employees have peer reviews, written tests, verbal exams and a field demonstration during their first year of employment. Henry added that the organization's process consists of two components – a "self-appraisal" and a supervisor's review.

Performance measures

Audrey, Craig, Doug, Greg, Josh and Kevin utilize results of projects or client interactions to measure employees' performance. Audrey stated,

> With any document that's prepared here, it's reviewed not only by a peer, but it's also reviewed by either their supervisor or someone who's a technical expert in their field. Those tend to, on a day-to-day basis, keep people accountable to being technically accurate in what they evaluate and portray.

Kevin also measures employees' performance on specific projects.

Craig, Doug, Greg and Kevin rely on feedback from clients to indicate whether employees are meeting the needs required by the position. Craig stated, "Our [clients] are those ones who, I think, help us evaluate just from hearing from them how we have served them." Doug stated,

> When farmers say we're doing a good job, it's a pretty good indication that we're taking care of them. When they make repeat calls, that means we're taking care of them. When those things slow on one customer, you know, hey, there's something wrong here. We're not taking care of them the way we need to.

Greg said that the organization asks clients about their needs, and tries to "tailor that training to fit as many as possible." Similarly, Kevin said,

> Very often, the requirements of our clients – basically, the challenges they face and the solutions we need to develop – will kind of uncover what we need to do to not only improve employee development, but take advantage of new technologies.

Josh indicated that individual employees' performance can be measured by the performance of the organization's programs. Josh stated, "We have measures of success for our major programs, most of which are represented by a position or positions at some point."

Internal communication

Fletcher and Ian noted that some evaluation is conducted through daily communication and interactions. Fletcher described the importance of internal communication, and stated, "If it's something bothering anybody and there's a communication issue, then they need to come and bring it to us and we'll address it. We don't allow them to fester that way." Similarly, Ian said,

> I think day-to-day interaction is much more important than that standard evaluation, because you can go 11 months and be doing terrible stuff, and then all of a sudden, 'Oh, I didn't know. I didn't know that bothered you. You could have told me the day it happened…' We communicate at least once a week in our staff meetings, and individually in between there about what's going on and how things are going.

Addressing supply of candidates

Participants were then asked to transition from discussing internal procedures, and begin brainstorming changes that should be made to address the supply of candidates for water-related positions. They were also asked for input based on what they were hearing from other organizations with water-related positions. See Table 23.

Table 23

Ideas to Address Supply Challenges

Theme	Sub-Theme	Category
Ideas to address supply of candidates	Awareness and recruitment	Increased awareness of job opportunities
		Lack of interest and awareness of what a job in "water" is
		Challenge of finding enough people to meet an organization's needs
		Need to match interests and abilities
		Certain jobs within "water" are not attractive or visible jobs
		Promote the need for technical workers
		Organizations need direct access to students
		Perception of quality of life in a particular geographical area
		Desire to leave rural area
		Awareness that natural resources jobs make a difference
		Salary and incentives offered in specific geographical areas
		Increasing diversity in backgrounds
		Recruit at the high school level
		Engage youth
		Reach out to women and minorities
		Attract agriculture students (or those with interest in agriculture) to law school
		Allow those with no current job in a water system to take the state certification exam
	Educational initiatives	Regularly adjust curriculum to meet the needs of the state
		Offer courses that focus on water topics
		Provide education on water law
		Provide animal science and ag economics courses focused on water
		University system works directly with industry to obtain industry input on curriculum needs
		Current "push" to develop relevant law programs
		Offer six-month or one-year schools focused specifically on local industry
	Aging workforce	Aging workforce in water-related positions
		Required time and effort to build a practice
		Need for new employees now so that those near retirement can train

Table 24

Ideas to Address Supply Challenges (Continued)

Theme	Sub-Theme	Category
	Demand for candidates	Organizations' lack of knowledge of what graduates' skills related to water resources
		Lack of infrastructure to implement water resources focus in industry
		Future need for water experts, once there is a return on investment for technologies
		More interest in water will lead to more programs in water, which will increase demand for jobs

Awareness and recruitment

Audrey, Doug, Elizabeth, Fletcher, Greg, Henry, Ian, Josh and Kevin indicated that awareness of job opportunities and recruitment efforts could address challenges in the supply of candidates for water-related positions. Doug, Greg, Henry and Kevin suggested the need for increased awareness of job opportunities. Doug stated, "It's really hard to find good, quality help out here in this area, and I believe it's because the people who really want to make careers and things like that just don't know that we have careers out here." Henry mentioned the same supply challenge was already a discussion point when Henry first entered the field, and stated,

> If you go out and just tell somebody, 'Well, would you like to work in the water supply industry?' That may not resonate very well, but once they understand what's involved, I think it all of a sudden becomes much more intriguing. So, I think it's just exposure – as many opportunities to engage with folks that are deciding on a career path. I think that's one of the things we need to do. Just get people interested.

Henry indicated that it is a struggle to find enough people to meet the needs of a particular organization, and efforts should be made to match candidates' interests to their abilities. Greg described a similar challenge related to job attractiveness.

> Water – I'm going to talk more on wastewater operators – it's not an attractive job. Nobody sees them. The only time they see them is when there's a leak out in the front of your house, and they're mad because the water's off. Other than that, they're behind the scenes.

Greg mentioned that another aspect of the job type that is not attractive to candidates is that it is shift work, and often requires night and weekend shifts. Kevin mentioned the need to promote the "need for technical people," as there is a growing demand for technical jobs and a smaller pool of graduates to recruit. Kevin also indicated a need for more direct access to students, either through scholarship opportunities or summer internships.

Audrey, Doug, Ian, Josh and Kevin indicated that some recruitment challenges might be related to geographical factors. Audrey attributed challenges recruiting candidates to the local area to "that intangible element of the perception of quality of life here." Doug said that students in local high schools are typically anxious to leave the rural area. Similarly, Kevin stated,

> My biggest challenge is that I can recruit good technical people, but it's very hard for me to get them to live in [the local area]… So, whatever can be done to basically not only promote the quality of life that you can have in a small, rural community, but also to emphasize the fact that what we do in a rural area with natural resources impacts everybody and does make a difference.

Ian noted that salary and incentives can motivate candidates to work in a specified area, and stated,

> Now, if you just want to draw locally, I think we do fine. I think there's a lot of qualified people in Kansas to fill a lot of water recreation and conservation positions, but if you want to get a more diverse group, I think you're going to have to elevate the salary. I mean, there's got to be something to attract them in.

In terms of diversity, Ian was referring to diversity in backgrounds, educational experiences and work experiences, to bring new ideas to a local area and job position. Josh also noted a need to increase salaries to recruit candidates to the state.

Elizabeth, Fletcher, Greg and Josh mentioned specific groups of individuals who could be focused on for recruitment purposes. Elizabeth indicated that recruitment efforts should be made on a high school level, and Josh mentioned engaging youth. Josh stated,

> I personally believe that the number one thing that we should be doing to get young people interested in conservation in general is you have to get their feet wet. Kids have to be able to go someplace that looks a little bit dangerous to their moms. Get in the creek, and maybe get muddy.

Josh also mentioned reaching out to women and minorities. Fletcher focused on recruiting students who are interested in agriculture to law school, and suggested establishing stronger connections between law schools and undergraduate agriculture programs. Greg suggested there are efforts to recruit at the high school level, but described challenges recruiting candidates specifically with no experience in a water system. Greg stated, "It's that state certification exam. The state will only allow a person that works for a water system to take the exam." Greg provided an example of students who studied engineering. "They're engineering and they understand everything, but since they do not work for a water system, they're not allowed to take that exam."

Educational initiatives

Craig, Doug, Elizabeth, Kevin and Luke described changes or additions that could be made in education to address supply challenges. Craig, Kevin and Luke focused on curriculum. Craig discussed how curriculum needs to be adjusted as situations – including water resources challenges – evolve across the state, and suggested offering classes specific to water topics. Craig also noted that "anybody who wants to get into this field, regardless of what position they're taking, needs a basic understanding of water law." Luke also suggested adding curriculum specific to water resources, and stated, "It would be really helpful if we had animal science and ag econ curriculum that included some water – maybe a three-hour course on water, both mechanical and regulation." When asked to describe what the course could contain, Luke added,

> I think going to a feedyard or two that would share how their water system works would be really well. I would think have them design their own water system. Give them basic scenarios on, you know, here's where your water wells are at, and here's the challenges coming toward you with reduced capacity. How are you going to handle it? How do you manage these wells and this water system? Then, I think basic underground geological structure would be important for them to understand.

Kevin said,

> We would be very open to working directly with the university system, especially K-State, to provide input on their curriculum, and explain some of our needs and to see if they could make either adjustments or just provide more opportunities to provide the sort of coursework and curriculum that would really prepare their students to meet our needs better.

Elizabeth indicated that the legal field, in particular, is observing "a huge push to develop programs" specific to water resources. Elizabeth said, "I think the legal community has begun to realize some of the opportunities that are out there, and are now beginning to compete for students that are interested in these areas."

Doug suggested looking beyond degree-earning educational opportunities.

> I think we would be far better served out here with maybe one-year schools, or even six-months-to-a-year schools, where it's totally focused on the type of industry in the area. Because, let's face it; not everybody wants to go to college. There's a lot of kids who are just ready to go to work. But, if they knew they could go somewhere for six months to a year and have the skills they needed to come into a job like we have to offer, and it doesn't matter if you have a piece of paper. You went through a tech school for six months to a year and you have basic electronic skills and things like this to fix a center pivot, or fix something to do with water or filtration – those kinds of things – and you have a basic, bare knowledge. We really believe something like that needs to be developed.

Aging workforce

Fletcher and Greg discussed the need to fill positions soon to be left vacant by retirees. Fletcher mentioned that most colleagues focused on similar issues are "all 60 years old," and noted the time and effort building the practice requires. Fletcher said it takes "the ability to communicate with producers and the desire to do the job," as well as being "willing to listen and

understand and learn the process." Greg described experiences in which, during internal training events, the participant asked how many employees expected to retire in the next five and ten years. Greg said about half of those in the room indicated that they would retire in the next five years, and about three-fourths of those in the room indicated that they would retire in the next ten years.

> We need more people in the field. Everybody's walking out the door, and when they walk out the door and don't have somebody to fill that knowledge, the knowledge goes with that guy and never comes back. A lot of them have that information from being in the field for 40 years. Everything's in their head, and not on paper, and when they're gone, it's not there. More interest in the field, because I think some of the seasoned operators would hang around and help those just because they care about their community, and still will live in their community.

Demand for candidates

Audrey, Ben and Josh indicated that there is not a supply challenge. Ben and Josh suggested that the challenge is actually related to a need to increase demand. Ben mentioned that organizations may not understand the skills sets students have when they are equipped with "various degrees related to water," and how those skill sets can help the organization. He stated, "I don't know that there is a good mesh between commercial and industrial folks and the world of academia in this field." He also discussed how some industrial organizations have begun to invest in water conservation technologies, while others have not, and stated, "My concern for commercial and light industry is we don't have the infrastructure yet to really exploit water conservation and beneficial water reuse." Ben then indicated that, once there is a return on investment for those advancements, the organization would need to fill a position focused specifically on water resources. Similarly, Josh said,

> Honestly, in Kansas, we are just awful at water conservation. We're terrible – I would argue probably the worst in the country. If you think about three out of four Kansas streams are impaired for some human use? We're better people than that,

> you know? There simply aren't enough jobs for people, and that's because there aren't enough programs, and there aren't enough programs because there's not enough interest. But, that's changing – that's really changing.

Chapter Summary

This chapter provided an in-depth analysis of the results of this study. The survey research generated data from 225 employers on supply and demand for jobs related to water resources, the general qualifications employers require of candidates for these jobs, existing professional development opportunities, and potential future demand for jobs related to water resources identified through plans for organizational growth. The interviews gathered qualitative data from in-depth discussions with 12 employers on the abilities they desire, typically observe and typically do not observe in candidates for water-related positions, as well as abilities they expect to require in the future. The qualitative data also focused on existing professional development needs, as well as preferences for which abilities to train using internal and external resources. Participants provided input on methods of reinforcing the importance of professional development and evaluating employees' abilities to meet the needs of their positions; and finally, ideas to address challenges related to supply of candidates for the positions discussed. The next chapter includes discussion of the results presented.

Chapter 5 - Discussion

In this study, researchers sought to address three research questions:

- Do current and potential employees' abilities and needs correspond to job requirements and reinforcements in career areas related to water resources in Kansas?
- What adjustments to abilities and/or needs are necessary to allow current and potential employees in water-related careers to achieve a stable work personality?
- What investments in human capital would help meet Kansas' needs in managing water resources?

This chapter discusses the application of the study's results within the context of these questions. It also includes implications for practice throughout the discussion, and concludes with recommendations for further research.

Do current and potential employees' abilities and needs correspond to job requirements and reinforcement in career areas related to water resources in Kansas?

The goal of this research question was to obtain a greater understanding of the supply and demand trends in water-related positions across the state. Data were gathered regarding both current and future projections for expected job vacancies in the water resources field. The researchers also sought to find job characteristics of existing positions, and measure whether candidates enter the field adequately prepared to meet the needs of the positions.

Job supply and demand

The survey data did not indicate much of a challenge in filling water-related positions. More than half of the respondents indicated their organizations had typically filled job vacancies

in less than six months over the past three years. The data also indicated there will be some demand for water-related positions, as "1-3 positions" was a common response across all occupational categories for expected vacancies. It should also be noted that "1-3 positions" was a common response for the organizations' current number of water-related positions. This suggests that, while organizations might not have currently had a large number of water-related positions, they did expect some turnover in those positions in the next three years.

Greg suggested that some of that turnover could be due to an aging workforce. He shared a personal experience in which he asked a room full of water system operators when they expected to retire. Greg said that about half of the employees indicated they would retire in the next five years, and about three-fourths indicated they would retire in the next 10 years. He later discussed a current challenge related to allowing potential inexperienced employees to take the required state certification exam. According to Greg, someone who has not already worked for a water system cannot take the exam, making entry into the field difficult for young professionals.

Another theme that emerged from both the survey and interview data was a current need to increase demand for water-related positions to meet the state's challenges related to water resources, rather than supply. Survey recipients indicated a common constraint preventing organizations from increasing the number of water-related positions was a lack of demand for water-related services. Those who indicated their organizations plan to increase the number of water-related positions also commonly noted "demand for services" as a primary reason, while those who indicated their organizations plan to decrease the number of water-related positions did not. This suggests organizations are not seeing a decline in demand for water-related services, but they are also not yet seeing an increased need.

Interview recipients elaborated on the topic, indicating increased demand could come within the next 10 years. Ben suggested there could be an increase in demand for candidates if industries better recognized potential candidates' skill sets related to water resources, and the value they could bring to organizations. He also indicated the organization would need to hire employees with specific expertise in water resources once there is a return on investment for technological advancements. Josh discussed how there is a growing statewide interest in conserving water resources. With that interest will come an increase in the number of programs focused on the issue, which will then increase demand for jobs. These participants alluded to the thought that industries have not yet fully incorporated relevant water management systems, either due to the cost of new technology or a lack of awareness or interest. However, as industries become increasingly focused on water resource management, demand for employees with water-related expertise could also increase.

Correspondence of need sets and reinforcer systems

Discussion of correspondence will first focus on the levels of correspondence observed through this study between employees' need sets and the organizations' reinforcer systems. As described previously in the theoretical framework, "need sets" are the components of the job that encourage the employee to work, and reinforcer systems are the stimuli provided by the organization for the employee to respond to. Correspondence measures the level of similarity between the two. For example, an employee's need set might include a certain salary level, and the reinforcer system would be the salary level offered by the organization.

The survey data indicated an average salary range among most occupational categories fell between $30,000 and $49,999. The exceptions included jobs in the processing category, which averaged between $50,000 and $59,999, as well as the professional, technical and

managerial occupational category, which averaged between $60,000 and $69,999. Ian and Josh discussed possible needs to improve salaries as reinforcer systems. When discussing possible methods of increasing the supply of candidates, Ian stated, “I believe that salary is the driver. Wages should be competitive, with the real possibility of raises and some sort of incentive package.” Josh said, “I think they have trouble recruiting talent because they don’t pay enough. The state of Kansas doesn’t offer great pay for very many positions,” and later stated, “I’d love to see us have environmental engineers and hydrologic engineers – look at the natural resource field and water conservation field – but, we’ve got to pay better if we’re going to do that.”

Another reinforcer system discussed in this study was existing professional development opportunities to meet employees’ needs to gain knowledge and abilities. More than half of the survey participants indicated their organizations offer internships. Additionally, respondents mentioned opportunities to participate in conferences, seminars and internal training events, and seek certificates and higher education. Interview participants also described a variety of existing professional development opportunities – both internal and external – as well as other methods their organizations employ to reinforce the importance of professional development. Participants listed a variety of ways in which the organization encourages employees to seek professional development, including known expectations for continued growth, internal discussion and encouragement, rewards, financial support and advancement opportunities.

The data did demonstrate, however, that organizations continually seek professional development opportunities and resources to provide their employees. Further, interview participants described some ability sets for which they currently train employees internally, but might prefer external resources. This suggests improvements could be made to existing reinforcer systems, which would, therefore, improve the level of correspondence between

reinforcer systems and need sets. The suggested improvements generated from the data will be discussed in greater detail later in this chapter.

Correspondence of ability sets and ability requirements

Second, discussion of correspondence will focus on the levels of correspondence observed between ability sets and ability requirements. Ability sets describe the skills and characteristics the employees are equipped with, while ability requirements describe the skills and characteristics the organizations need in employees to ensure they are able to complete the tasks necessary for the specific positions. Correspondence describes the levels of similarity between the two.

Both the survey and interview data generated examples of ability requirements. In general, the data suggested ability requirements include a variety of both employability and technical skills. In regard to employability skills, the need for communication skills was a clear theme. Interview participants provided detailed descriptions of the types of communication skills they look for, and mentioned the ability to listen and ask questions, "speak the language" of a variety of stakeholders, and communicate through technical writing. The data indicated the technical skills required by organizations were job-specific, but knowledge of hydrology, the state's water system – including its laws and regulations – and methods of compliance to those regulations were commonly mentioned. Craig specifically stated that, no matter the position within the field of water resources, employees in water-related positions need a basic understanding of water law.

The survey and interview data also generated a variety of examples of typical ability sets observed in either candidates or recent hires. More than three-fourths of survey respondents agreed that an inability to perform interpersonal skills, basic skills required for their positions

and/or technical skills specific to their water-related responsibilities were factors influencing recent decisions not to hire candidates. They frequently listed an array of interpersonal skills, discipline-specific skills and technical skills as ability sets they frequently found to be lacking. Interview participants were also asked to describe the ability sets candidates typically lack, as well as those they typically demonstrate well upon hire. The responses varied greatly. While Fletcher indicated candidates typically demonstrate the ability to communicate, Audrey and Ian specifically described typical gaps in communication skills. While Fletcher indicated candidates can usually demonstrate a basic understanding of water policy and law, Audrey and Elizabeth described typical gaps in policy knowledge. Fletcher later reflected and indicated candidates may not typically know enough about water policy. While Josh and Kevin indicated candidates are typically equipped with at least a basic understanding of the technical needs of the positions, an array of technical abilities were also described as typical ability gaps. It should be noted, however, that while no major themes emerged from the interview data regarding abilities typically demonstrated well upon hire, three sub-themes emerged regarding typical ability gaps – lack of experience, lack of knowledge, and lack of employability skills.

The study also focused on ability requirements and ability sets in terms of education and experience. While the survey data indicated organizations do not require a large number of years of experience, respondents did indicate they value experience. Nearly three-fourths responded that they value experience more than education. The data also indicated a preference for current employees or experienced candidates when filling job vacancies. Interview participants attributed a range of technical skill gaps to lack of experience, to be discussed in greater detail in the second section of this chapter. In terms of educational requirements, survey data indicated that candidates typically have achieved higher levels of education than is required. Interview

participants did not discuss a need for candidates to have achieved higher levels of education than they are typically equipped with. Rather, they discussed needs for candidates to have focused their education in specific technical areas, such as hydrology, geology, environmental studies, engineering or water systems.

This data suggest a lack of correspondence between ability sets and ability requirements in a couple of ways. Organizations with water-related positions clearly prefer candidates who have experience in the field. However, they do not actually require many years of experience. Second, participants expressed a variety of organization- or job-specific preferences related to technical degrees or knowledge areas, but again, their actual requirements typically do not match. Further, as the sub-themes – knowledge of science and engineering, and knowledge of the water system – derived from the interview data suggest, most of the technical ability requirements mentioned by interview participants related to knowledge of technical areas. When they spoke of gaps in ability sets, however, the technical abilities began to relate more closely to specific skills. So, again, it seems employers would prefer to have candidates equipped with not only knowledge of their technical job responsibilities, but also skill. However, they only seem to require the knowledge and educational experience. This distinction between preferences and requirements suggests that, while the data indicates that organizations typically do not face challenges when filling job vacancies, organizations may not be hiring candidates equipped with the ability sets they truly prefer.

Implications for practice

First, in regard to supply and demand, participants offered a variety of perspectives related to addressing either supply or demand challenges in water-related positions. One challenge that could be addressed is that which a participant described regarding the state

certification exam for water system operators. Perhaps, if requirements for the exam could be changed or exceptions made to allow inexperienced, potential employees to take the exam, supply challenges for water systems operators could be at least partially addressed. First, other states' processes for providing certification that operate under a model similar to that of Kansas could be studied. Then, a provisional exam could be developed to allow an inexperienced professional to pass the exam and work in the field for a probationary period, at which point the professional could then participate in the existing exam to earn the full certification. Considering the discussion related to an aging workforce in career areas including water system operators, taking this step could be important to ensure inexperienced employees have an opportunity to learn from the experienced employees before they reach retirement.

There are certainly additional implications for practice related to the first research question. Such implications relate to areas lacking correspondence, as discussed, as well as preparing potential employees for future careers once demand for such employees increase in industry. These implications will be discussed in greater detail later in this chapter.

Recommendations for further research

This study focused more on measuring correspondence levels between ability sets and ability requirements, and identifying possible adjustments to ability sets to better meet organizations' ability requirements. While the study identified one need set of employees – salary - further research could more directly address need sets of employees in water-related positions by identifying employees for a sample, rather than employers. Then, correspondence levels between need sets and reinforcer systems could be better measured.

In addition to research related to general need sets, further research could focus on the salaries themselves. Direct discussion related to the need to potentially increase salaries to

address challenges in supply of employees surfaced during the interviews of this study, suggesting potential value in examining specific areas in the field in which salaries should be adjusted to better meet employees' need sets. Additionally, as described in the limitations section for this study, participants in the survey research might have faced challenges most accurately reporting current salary ranges. Future research could better clarify the true nature of this challenge.

Finally, as presented in the results and discussion, some of the interview participants mentioned that demand for employees in water-related positions could likely increase in the future, once industries and organizations are better able to implement new technologies. The discussion indicated organizations would first need to see a return on investment that has not yet been apparent to act upon. However, the participants noted the importance to the state's water supply of finding ways to implement those technologies. It should also be noted certain trends surfaced in those discussions. Both participants who indicated a lack of challenge related to supply for candidates represented the industrial category. Participants who indicated technologies have already been implemented in their operations – at least to some extent – through conversation related to training challenges they already face represented the livestock water and waste category. This serves an example to the notion that perhaps industries have identified ways to implement technologies at different rates. Therefore, additional research could aim to better understand the barriers organizations face for implementing water technology, as well as how organizations could be supported to address those barriers. Further, research could aim to identify fields or industries in which these challenges are most prevalent.

What adjustments to abilities and/or needs are necessary to allow current and potential employees in water-related careers to achieve a stable work personality?

As described in the theoretical framework, an employee achieves a stable work personality when the employee's level of satisfaction toward the work environment and the employer's level of satisfactoriness expressed toward the employee's performance lead to no significant change in ability or need sets. As was discussed in the previous section of this chapter, a lack of correspondence particularly between ability requirements and ability sets appears to exist. Therefore, adjustments to abilities might be necessary to allow current and potential employees to better meet the needs of their positions. This could, in turn, lead to greater levels of satisfactoriness expressed toward employees' abilities and, therefore, allow employees to achieve more stable work personalities.

Field experience

As mentioned previously, this study's participants indicated that, while they value educated employees, they prefer experience. Interview participants also described a variety of ability gaps, which they relate to lack of experience. Participants indicated certain abilities that are important to the positions, such as mechanical skills, design implementation, troubleshooting, problem solving, business nuances and client relationships are difficult to develop without experience in the organization. In fact, most of the technical skills included in participants' descriptions of ability gaps were attributed to lack of experience. When considering the aging workforce and resulting knowledge gap described by participants, this suggests a need to identify ways to help young professionals gain field experience as they prepare for careers.

Skill development

Data from the study indicated mixed experiences and preferences in terms of employees' readiness to put employability skills and technical skills to use upon hire. When survey participants were asked to rate factors influencing recent decisions not to hire candidates, participants rated candidates' abilities to perform interpersonal skills, basic skills required for their positions and technical skills specific to their water-related responsibilities very similarly. They also indicated that each of those gaps in skills are challenges quite frequently, as nearly three-fourths of respondents agreed that each were factors influencing their recent decisions. Further, when asked to rank factors influencing hiring decisions, survey participants frequently listed work ethic and abilities to work with others or in specified environments – which could both be categorized as employability skills – as well as technical or water resources-specific knowledge as important factors in those decisions. Participants also listed an array of employability and technical skills when asked to list specific ability gaps frequently observed in candidates for water-related positions.

These data suggest employers have observed skill gaps in both interpersonal and technical abilities, but consider both areas of ability to be of importance upon hire. This is worth noting, as it supports the existing literature describing the emphasis on employability skill development (Jackson, 2010; Robinson & Garton, 2008). However, it also supports the literature acknowledging that, while employability skills are important, a focus on job-specific skills are also necessary (Cappelli, 2015; Jackson, 2010). This suggests a need to ensure candidates for water-related positions are equipped with employability and technical skills relevant to the specific jobs they are seeking.

Interview participants provided a variety of suggestions in regard to improvements in candidates' ability sets. In terms of employability skills, communication skills were frequently mentioned as ability requirements, as described in the previous section of this chapter. Specific gaps in communication skills were also mentioned, including the ability to discuss water issues with a variety of stakeholders and use scientific writing skills to relay information. In terms of technical knowledge and abilities, the "lack of experience" and "lack of knowledge" sub-themes derived from the interview data suggest that, first, job applicants should be readily equipped with knowledge of the Kansas water system and its regulations. Then, it would be helpful if applicants, even recent graduates, had some technical experience specific to their positions. This could better prepare them to apply their basic knowledge of the technical responsibilities in the field, and take the application of that knowledge to the next level to troubleshoot and problem solve.

Interview participants also continually emphasized a need to consider technological advancements. Participants noted recent changes in technology in which their employees were expected to learn to utilize. They reiterated the importance of employees' ability to learn and adapt as technology continues to change, despite the challenge of not necessarily anticipating the opportunities technology might bring. Participants also noted that, where some industries or specific organizations might not have yet implemented available technology specific to water resources, they are likely to do so in the future as technology becomes more affordable.

Therefore, this data offers suggestions related to better equipping potential employees with abilities to achieve more stable work personalities both now and in the future. Perhaps employees could achieve more stable work personalities in current workplace environments if they were increasingly knowledgeable of the water system, and in particular, its policies and

regulations. Additionally, opportunities that provide potential employees with job-specific experience prior to employment could help them achieve more stable work personalities during the early-employment adjustment period. Then, an improved, efficient system of providing both potential and current employees with abilities to implement new technologies could help ensure more consistent stable work personalities in the field of water resources in the future.

Implications for practice

As so many ability gaps seem to be based in a lack of experience, it seems one way of adjusting ability sets to better correspond to ability requirements might be to identify ways of equipping potential employees with experience. Slightly more than half of the questionnaire respondents indicated their organizations provide internships, and one of the interview participants specifically noted possibilities associated with doing so. If organizations provided internships, perhaps a number of challenges participants noted could be addressed. Potential employees could become better aware of not only the variety of job opportunities in water resources, but also the specific responsibilities within those jobs, particularly within those less visible or attractive jobs. Experiencing firsthand opportunities to use new technologies and work in a career that makes a difference in communities could generate interest in the field. It could also present opportunities for potential employees to learn directly from those with extensive experience in the field, helping to address the challenge related to an aging workforce discussed in the previous section. Additionally, it could help expose potential employees to communities or geographical locations that struggle to recruit talent. If the potential employees have the opportunity to reside in such locations for a period of time, they might find the value of living and working in those areas.

Recommendations for further research

While themes in ability gaps that could be addressed through professional development initiatives certainly surfaced in this study, there were still a number of ability areas that seemed specific to certain job types or organizations. They were noted as important ability gaps to consider with respect to addressing any lack of correspondence between ability gaps and ability requirements. Potential implications for practice related to the themes that emerged in this study will be discussed in the next section, as those themes seem to address knowledge and ability areas relevant to any position related to water resources. However, further research could help either identify additional ability adjustment needs or quantify those needs to help academia better understand which ability sets should be focused on through academics to best prepare an array of future employees.

For example, interview participants in this study noted that they often train employees on hydrology, sampling techniques and engineering design, as their organizations have specific standards for employees to meet. However, it could be helpful to those employers if potential employees came equipped with a basic understanding of each of those skill areas, which the employer could then reiterate as the skills are most relevant to the organization. As those specific ability areas are unique to three interview participants of this study, however, quantitative research could further advance those suggestions to better understand the variety of topics academia could focus on that could equip potential employees with helpful, basic understanding in a variety of job areas.

What investments in human capital would help meet Kansas' needs in managing water resources?

The previous research question leads to a discussion regarding the investments in human capital that could better equip potential candidates with the abilities described in the previous section, and in turn, help meet Kansas' needs in managing water resources.

Existing opportunities

This study provided some insight in terms of professional development opportunities already utilized by organizations with water-related positions. As described in the first section of this chapter, participants indicated a presence of both internal and external professional development resources as reinforcer systems. However, while resources currently exist, when survey participants were asked to choose resources they would utilize for professional development if available, most respondents selected all options. This suggests that while a wealth of existing internal and external reinforcer systems were described in the data, organizations were still looking for – or at least, would utilize – additional resources. Additionally, the interview participants described specific topics existing opportunities focus on, and also mentioned topics for which they wished external resources would provide professional development. As Luke stated,

> We do offer tuition reimbursement, if there was something related to that field that they wanted to go do it. I haven't seen that used much in terms of water, though. I'll tell you, we just haven't come across a whole lot of external training opportunities in that field.

Kevin said, "I think we certainly would take advantage of external sources if they could provide some of the training for some of the more unique things we do – for the things that we perhaps do in-house now because there are no alternatives." Josh listed both employability and technical skills as areas of focus for internal training resources.

However, he later revealed a preference for technical training to take place at "universities for places where technical training arises," if it were available. These participants suggest that their organizations' reinforcer systems could be changed or enhanced if additional resources were available.

Educational initiatives

With that – as well as discussion from the previous section regarding specific ability sets for which professional development could be improved – in mind, this study uncovered suggestions for investments in education specific to meeting human capital needs in water resources. To continue the discussion of whether resources should be focused on employability skills or technical skills, it is important to note again that the data indicates a needed emphasis on both ability areas. However, while participants discussed the need for employability skills and the frequent gaps in those abilities, "employability skills" emerged as a sub-theme for ability sets for which to train internally, but not as a sub-theme for ability sets for which to train externally.

If asked to preference, participants seemed to shape an ideal professional development environment as one in which their internal resources could enhance employees' employability skills where they may lack, and external resources provide knowledge and experiences to better equip employees with technical skills and expertise. Particularly, participants noted the challenge of maintaining their internal resources related to technical skills as technology continually shapes the skills to be attained, similar to the discussion in the literature referring to academia's challenge of equipping students for ever-changing job responsibilities (Yang, 2013). This leads to discussion of Kevin's suggestion. He said,

> We would be very open to working directly with the university system, especially K-State, to provide input on their curriculum, and explain some of our needs and to see if they could make either adjustments or just provide more opportunities to

> provide the sort of coursework and curriculum that would really prepare their students to meet our needs better.

This aligns very closely to discussion in the literature regarding the need for increased conversation between academia and employers to better prepare potential employees for specific jobs (CareerBuilder, 2014). This suggests that perhaps this increased conversation could help the education system better prepare potential employees for STEM careers in a fast-changing field like water resources. Doug suggested developing short-term technical programs specific to local industry. He said, "I think we would be far better served out here with maybe one-year schools, or even six-months-to-a-year schools, where it's totally focused on the type of industry in the area. Because, let's face it; not everybody wants to go to college."

On the other hand, participants also indicated that for many technical abilities, employees could be better trained internally, as those abilities are very organization- or job-specific. For example, Audrey noted that there are a variety of sampling techniques, but the organization prefers specific techniques to be used. Henry discussed design standards, noting that the organization has developed certain standards it expects employees' designs to meet. Kevin discussed hydrologic methods, and indicated that curricula would need to change in order to equip potential employees with knowledge of the specific hydrologic methods the organization utilizes. This suggests that the basic knowledge necessary for these abilities – in the case of each of these examples, sampling techniques, engineering design and hydrology – could be helpful, and then organizations could reinforce the areas of the knowledge most pertinent to their needs.

As described earlier in this chapter, however, the study uncovered two areas of ability in which candidates frequently lack, aside from the employability skills already discussed – technical abilities acquired through experience and knowledge of the water system. Based on the data, it seems that identifying methods of providing potential employees with field experience

could aid in the development of the necessary technical skills. Doug noted that such skills are better learned through work experience, and not in a classroom. Luke, however, suggested that the field experience could be obtained in an educational setting. He described, in detail, how curricula intended for academia could accomplish this with the following example:

> I think going to a feedyard or two that would share how their water system works would be really well. I would think have them design their own water system. Give them basic scenarios on, you know, here's where your water wells are at, and here's the challenges coming toward you with reduced capacity. How are you going to handle it? How do you manage these wells and this water system? Then, I think basic underground geological structure would be important for them to understand.

This suggests that perhaps courses could be added to enhance existing degree areas, providing students with knowledge and hands-on experience in the field of water resources as it applies to their chosen degree.

Participants also noted the importance of understanding the water system and its regulatory requirements. As Craig stated, "Anybody who wants to get into this field, regardless of what position they're taking, needs a basic understanding of water law." This suggests that, no matter the occupation an individual seeks related to the field of water resources, and no matter the job preparation route the individual takes, training related to how water resources are managed across the state is pertinent. This suggestion could open a large window of opportunity for which to provide training on the subject, through means such as courses within academia, training resources provided directly to employers, or opportunities provided by either the public or the private sector.

Recruitment and awareness

Many suggestions uncovered in the data also referred to the need to invest in raising awareness of job opportunities in the field of water resources, and more effectively recruiting

individuals to those jobs. Participants discussed the lack of visibility and/or appeal in some jobs within the field, and noted that individuals need a better understanding of the responsibilities and impact of the positions. Participants also discussed the need to improve recruitment efforts with specific demographics, such as youth, high school students, and women and minorities. Further, the data suggests that in some areas, the geographical location of the organization could be a factor influencing potential employees' interest.

These suggestions could lead to a need to focus efforts on outreach prior to the age in which individuals are expected to make job choice decisions. For youth, that could mean outreach efforts focused on exposing them to the water system. As Josh described,

> I personally believe that the number one thing that we should be doing to get young people interested in conservation in general is you have to get their feet wet. Kids have to be able to go someplace that looks a little bit dangerous to their moms. Get in the creek, and maybe get muddy.

For high school students, it could mean outreach efforts focused on helping them understand the responsibilities and impacts of careers in water resources, and the benefits of remaining in communities where recruiting talent has been challenging. As Kevin described,

> My biggest challenge is that I can recruit good technical people, but it's very hard for me to get them to live in [the local area]… So, whatever can be done to basically not only promote the quality of life that you can have in a small, rural community, but also to emphasize the fact that what we do in a rural area with natural resources impacts everybody and does make a difference.

For students in varying levels of higher education or individuals already in the workforce, it could mean outreach efforts focused on helping them understand how their interests could lead to careers in water resources. Henry discussed how efforts should be made to match candidates' interests to their abilities. Additionally, participants with specific interest in the legal field noted the development of a new water law program. Fletcher mentioned the need to recruit college students bound for law school with interests in agriculture or natural resources. Perhaps

individuals could become more interested in the field if they understood where their interests and abilities apply within the field of water resources.

Other discussion related to investing in improvements in salary as reinforcer systems, particularly to more effectively recruit potential employees from outside of the state. Ian saw less challenge recruiting within the state, but noted that salary could be a factor when recruiting from other areas of the nation. This suggests that if efforts are to be made to seek individuals with varying backgrounds and experiences in regard to geographical location, perhaps investments in improving such reinforcer systems could be beneficial.

Implications for practice

This discussion leads to potential implications for practice in academia. First, a sub-theme that clearly emerged in this study was the need to better equip potential employees with knowledge of the Kansas water system. Therefore, if academia were to create programs related to water resources, it seems this topic could be a good place to start, as it appears to have relevance in any job that relates to water resources. The data indicate a program focused on building potential employees' knowledge of the water system could include topics such as general hydrology in Kansas, as well as how water resources are managed through policy and regulation. Additionally, it could be beneficial for potential employees to gain topical understanding of the conversations taking place related to water resources, both within the state and beyond, as these conversations could drive industry's focus on water resources and the technologies developed and ultimately impact career responsibilities.

Second, another sub-theme that has already been discussed was the need to help potential employees gain experience relevant to their specific fields of interest. As the topic of internships has already been addressed, this discussion will focus on an additional way potential employees

could gain hands-on experience. Even though the topic of experience has been reiterated many times throughout this study, it should be noted the data still indicated employers value the education their potential employees receive. Perhaps then, in practice, the two could be combined. The idea shared by one of the interview participants earlier in this discussion regarding the development of a course that takes students into the field could be implemented. For example, academic institutions could include curricula focused on water resource management within a number of majors and programs. As students learn about the water system and managing the resources within the context of their chosen fields of study, they could visit a relevant operation to experience firsthand how those practices are implemented in the field. Then, related in-class projects could reinforce the learning that took place through the experience and challenge students to problem solve and troubleshoot to achieve a higher level of understanding. In addition to addressing ability gaps, these courses or programs could also aid in recruitment efforts. Discussion among participants indicated students may not understand the opportunities these careers could provide, or do not understand how their unique ability sets and interests could fit in careers related to water resources. Developing programs within existing majors or departments could help students draw connections between the interests they have already identified and opportunities in water resources.

Third, the point Doug made about the need to provide education to those who may not wish to seek a two- or four-year degree is worth noting. Based on this discussion, community colleges and technical programs could have an opportunity to develop programming specific to water resource use and management in the local area. Short-term programs – perhaps six months to one year in duration – could prepare potential employees for particularly the technical career areas related on water resources. The programs could provide hands-on, practical instruction in a

comparatively short term. Additionally, as Doug discussed, these programs could also provide the benefit of retaining local talent in certain geographies by preparing students for careers specifically needed in the local area.

Fourth, while the data indicated some discrepancy in how employability skills should be attained – through internal or external professional development resources – there was certainly discussion of the need of employability skills in the data. Perhaps an academic program that blends concepts in water resources with attainment of critical thinking, problem solving, and troubleshooting could be valuable for students pursuing a variety of water-related careers. These skills could better prepare potential employees to critically apply technical knowledge once in the workplace.

Each of these implications for practice could be best supported by increasing conversation between academia and industry. Doing so could also help address a third sub-theme that surfaced through this study with respect to addressing ability gaps – understanding and utilizing technology relevant to water resources. The data indicate employers face an ongoing challenge of maintaining their own training resources to include the most recent technological advancements, and employers might appreciate the opportunity to utilize external professional development resources for these ability adjustments. Further, it seems many organizations have resources set aside to support employees' professional development, but might not have identified sources of professional development specific to water resources. If university extension services or technical programs increased conversation with industry – which should include all areas of water use – and developed and maintained professional development resources related to technologies most needing implementation by those industries, organizations may find value in participating in such training programs. It also seems to be an appropriate time

to increase those conversations and focus on developing resources related to technology use in the field, as the data indicate demand for employees could increase as organizations begin to more completely implement technologies. This increase in conversation could help academia identify emerging concepts needing instruction, while also providing valuable lifelong learning opportunities to industry.

Finally, a need to focus on recruitment efforts emerged as a theme in this study. Other implications for practice already discussed could provide benefits related to raising awareness and recruiting potential employees, as noted. Interview data suggest youth recruitment is a valued area for future development. Therefore, perhaps better implementing hands-on learning experiences related to water resources in youth classrooms could be beneficial to generating interest in the field at a young age. This could also serve as an additional opportunity to include local industry in these efforts. If youth could become increasingly exposed to water resource use and management in their local area, their understanding of opportunities in careers related to water resources as well as awareness of needs related to water resources specific to their local area could be enhanced. At the same time, local industry could benefit from building relationships with schools and potential future employees in the area.

Recommendations for further research

This qualitative study took an in-depth approach at understanding professional development needs of employees in water-related positions with a sample of 12 employers. Similar to the recommendation related to better quantifying need sets and ability gaps in the previous sections, further research could aim to quantify those professional development needs. This could support both public and private sector entities wishing to create professional

development resources intended for both widespread use by employees in the field, and intended for narrower scopes of employees more focused on specific positions within the field.

Summary

The results of this study suggest few challenges currently exist in filling vacancies for jobs related to water resources, but demand for potential employees and professional development opportunities could increase as technology changes and becomes less expensive for industries to adopt. The results also suggest varying levels of correspondence exist between ability sets and ability requirements. The results indicate there are discrepancies between abilities for which organizations prefer candidates are equipped, and those they actually require. Further, while organizations provide various reinforcer systems related to meeting employees' professional development needs, the data identified opportunities to add to or enhance existing professional development opportunities. According the results of this study, providing potential employees with field experience and better preparing them with knowledge of the Kansas water system could be two areas in which investments in education could improve human capital in the water resources field. Additionally, investments in recruitment and awareness efforts could do the same.

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Appendix A - Questionnaire

INFORMED CONSENT
Assessing Supply, Demand and Professional Development Needs of Employees in Water-Related Careers

Dear Participant,

The state of water resources varies greatly across the state of Kansas. In many areas, the demand for quality water exceeds supply, resulting in a need to focus on improving the quality and quantity of water resources in the state. In 2013, Governor Sam Brownback issued a call to action to his administration to develop a long-term vision for the future of the state's supply, to be developed based on public input. The resulting vision placed emphasis on the need for education and workforce development related to water resources, and many parties are invested in the success of employees in the field. In order to learn how to best prepare current and future employees in water-related careers, we would appreciate your assistance by participating in this research study, "Assessing Supply, Demand and Professional Development Needs of Employees in Water-Related Careers" as part of my graduate degree program. You are invited to join this study because of your affiliation with a business, municipality, agency or non-profit organization that hires employees in water-related job positions. Your participation in this study will involve completion of the following survey, focused on the supply and demand of employees in water-related careers. We estimate the survey will take approximately 10 minutes to complete. Any information reported from this study will be reported anonymously as aggregate data from all respondents. If you have questions about your rights concerning this study, please contact Rick Scheidt, Chair, Committee on Research Involving Human Subjects, 203 Fairchild Hall, Kansas State University, Manhattan, KS 66506, (785) 532-3224. You will not be compensated for your participation in this study. If at any time you wish to withdraw from the study, you may do so without penalty. Your cooperation will enable the researcher to gain valuable insights into the need for employees prepared to meet the demand of careers addressing water quality and quantity challenges in Kansas. The data gained during this study may be used to develop programs to help meet the needs of current and future employees in water-related job positions. If you have any questions regarding this research study, please contact Jordan Pieschl (jpieschl@ksu.edu) or Shannon Washburn (sgw@ksu.edu) by email. The results of this study will be made available to you at the conclusion of this study.

Sincerely,

Jordan Pieschl	Shannon Washburn
Graduate Student	Professor

By checking the box below, you indicate you have given your consent to participate in Jordan Pieschl's study under the direction of Dr. Shannon Washburn, designed to learn about training needs for employees in water-related careers. Participation involves no additional work requirements for completion and no compensation. You have read this description and volunteer to participate in this study.

❍ I give my consent to participate.

For the purpose of this questionnaire, the term "water-related positions" describes careers with major responsibility in water-related tasks.

Q1. In which district(s) of Kansas is your organization primarily located? Select all that apply.

- ❑ Northwest
- ❑ North Central
- ❑ Northeast
- ❑ West Central
- ❑ Central
- ❑ East Central
- ❑ Southwest
- ❑ South Central
- ❑ Southeast
- ❑ N/A

Q2. Select the area(s) that best describe the focus of water-related positions in your organization. Select all that apply.

- ❑ Irrigation
- ❑ Livestock Water/Waste
- ❑ Industrial
- ❑ Municipal
- ❑ Recreation
- ❑ Legal
- ❑ Other _____
- ❑ N/A

Q3. Which of the following occupational categories best describe the primary responsibilities of the water-related positions in your organization? Select all that apply.

Professional and Managerial: This category includes occupations concerned with the theoretical or practical aspects of fields. Most of these occupations require substantial educational preparation. Examples of water-related careers in this category could include engineers, scientists, veterinarians, lawyers, agricultural educators, and organization directors.

Clerical and Sales: Clerical occupations include those concerned with compiling, recording, communicating, computing and otherwise systematizing data. Sales occupations include occupations concerned with influencing customers in favor of a commodity or service. Examples of water-related careers in this category could include clerks and sales representatives.

Service: This category includes occupations concerned with serving individuals, households and establishments and protecting their water resources. Examples of water-related careers in this category could include environmental consultants.

Agricultural, Fishery, Forestry, and Related: This category includes occupations concerned with propagating, growing, caring for, and gathering plant and animal life and products. Examples of

water-related careers in this category could include farm and ranch workers, landscapers, and nursery and greenhouse operators.

Processing: This category includes occupations concerned with refining, mixing, compounding, chemically treating, heat treating, or similarly working with materials and products. Examples of water-related careers in this category could include water treatment plant operators, food processing plant operators, and hazardous material removal workers.

Machine Trades: This category includes occupations concerned with the operation of machines. Some jobs might require an understanding of machine functions, blueprint reading, making mathematical computations and exercising judgment to attain conformance to specifications. Examples of water-related careers in this category could include equipment operators.

Benchwork: This category includes occupations concerned with the use of body members, handtools, and bench machines to fit, grind, carve, mold, paint, sew, assemble, inspect, repair, and similarly work relatively small objects and materials. The work is usually performed at a set position in a mill, plant, or shop, at a bench, worktable, or conveyor. Examples of water-related careers in this category could include parts repairmen, product developers, and production or assembly line workers.

Structural Work: This category includes occupations concerned with fabricating, erecting, installing, paving, painting, repairing, and similarly working structures or structural parts, such as bridges, buildings, roads. Examples of water-related careers in this category could include equipment repairmen, construction workers and equipment installation workers.

Miscellaneous: In this category, include occupations not described in the previous categories. An example of a water-related career in this category could include occupations in recreation.

- ❑ Professional, Technical, and Managerial
- ❑ Clerical and Sales
- ❑ Service
- ❑ Agricultural, Fishery, Forestry, and Related
- ❑ Processing
- ❑ Machine Trades
- ❑ Benchwork
- ❑ Structural Work
- ❑ Miscellaneous

Q4. How many water-related positions (including both filled and unfilled) does your organization have in each of the following occupational categories?

	1-3 positions	4-6 positions	7-9 positions	10+ positions	N/A
Professional, Technical, and Managerial	❍	❍	❍	❍	❍
Clerical and Sales	❍	❍	❍	❍	❍
Service	❍	❍	❍	❍	❍
Agricultural, Fishery, Forestry, and Related	❍	❍	❍	❍	❍
Processing	❍	❍	❍	❍	❍
Machine Trades	❍	❍	❍	❍	❍
Benchwork	❍	❍	❍	❍	❍
Structural Work	❍	❍	❍	❍	❍
Miscellaneous	❍	❍	❍	❍	❍

Q5. How many new hires has your organization had for water-related positions in the following occupational categories in the past three years?

	0 new hires	1-3 new hires	4-6 new hires	7-9 new hires	10+ new hires	N/A
Professional, Technical, and Managerial	❍	❍	❍	❍	❍	❍
Clerical and Sales	❍	❍	❍	❍	❍	❍
Service	❍	❍	❍	❍	❍	❍
Agricultural, Fishery, Forestry, and Related	❍	❍	❍	❍	❍	❍
Processing	❍	❍	❍	❍	❍	❍
Machine Trades	❍	❍	❍	❍	❍	❍
Benchwork	❍	❍	❍	❍	❍	❍
Structural Work	❍	❍	❍	❍	❍	❍
Miscellaneous	❍	❍	❍	❍	❍	❍

Q6. How many current vacancies does your organization currently have for water-related positions in the following occupational categories?

	0 current vacancies	1-3 current vacancies	4-6 current vacancies	7-9 current vacancies	10+ current vacancies	N/A
Professional, Technical, and Managerial	❍	❍	❍	❍	❍	❍
Clerical and Sales	❍	❍	❍	❍	❍	❍
Service	❍	❍	❍	❍	❍	❍
Agricultural, Fishery, Forestry, and Related	❍	❍	❍	❍	❍	❍
Processing	❍	❍	❍	❍	❍	❍
Machine Trades	❍	❍	❍	❍	❍	❍
Benchwork	❍	❍	❍	❍	❍	❍
Structural Work	❍	❍	❍	❍	❍	❍
Miscellaneous	❍	❍	❍	❍	❍	❍

Q7. How many vacancies does your organization expect to have in water-related positions in the following occupational categories in the next three years?

	0 vacancies	1-3 vacancies	4-6 vacancies	7-9 vacancies	10+ vacancies	N/A
Professional, Technical, and Managerial	❍	❍	❍	❍	❍	❍
Clerical and Sales	❍	❍	❍	❍	❍	❍
Service	❍	❍	❍	❍	❍	❍
Agricultural, Fishery, Forestry, and Related	❍	❍	❍	❍	❍	❍
Processing	❍	❍	❍	❍	❍	❍
Machine Trades	❍	❍	❍	❍	❍	❍
Benchwork	❍	❍	❍	❍	❍	❍
Structural Work	❍	❍	❍	❍	❍	❍
Miscellaneous	❍	❍	❍	❍	❍	❍

Q8. What are the current salary ranges for water-related positions in the following occupational categories?

	>$20,000	$20,000-29,999	$30,000-39,999	$40,000-49,999	$50,000-59,999	$60,000-69,999	$70,000-79,999	$80,000-89,999	$90,000-99,999	$100,000-109,999	>$109,999	N/A
Professional, Technical, and Managerial	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Clerical and Sales	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Service	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Agricultural, Fishery, Forestry, and Related	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Processing	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Machine Trades	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Benchwork	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Structural Work	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Miscellaneous	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

Q9. Does your organization currently provide internships?

❍ Yes
❍ No
❍ N/A

Q10. What professional development opportunities does your organization currently provide for employees in water-related positions?

Q11. What resources would your organization utilize, if provided, to offer professional development opportunities for employees in water-related positions? Select all that apply.

❑ Universities/Extension
❑ Government Agencies
❑ Private Training and Professional Development
❑ In-House Training and Capacity Development
❑ Other _____
❑ N/A

Q12. Of the resources you selected, drag each option to rank the resources in order of your preferred source of professional development (1=Most Preferred).

_____ Universities/Extension
_____ Government Agencies
_____ Private Training and Professional Development
_____ In-House Training and Capacity Development
_____ Other
_____ N/A

Q13. How many years of work experience does your organization typically require of candidates for the following occupational categories?

	0 years	1-3 years	4-6 years	7-9 years	10+ years	N/A
Professional, Technical, and Managerial	❍	❍	❍	❍	❍	❍
Clerical and Sales	❍	❍	❍	❍	❍	❍
Service	❍	❍	❍	❍	❍	❍
Agricultural, Fishery, Forestry, and Related	❍	❍	❍	❍	❍	❍
Processing	❍	❍	❍	❍	❍	❍
Machine Trades	❍	❍	❍	❍	❍	❍
Benchwork	❍	❍	❍	❍	❍	❍
Structural Work	❍	❍	❍	❍	❍	❍
Miscellaneous	❍	❍	❍	❍	❍	❍

Q14. What is the minimum level of education your organization requires of candidates for the following occupational categories?

	Less than high school	High school diploma or equivalent	Some college	Two year degree	Four year degree	Professional degree	Doctorate	N/A
Professional, Technical, and Managerial	❍	❍	❍	❍	❍	❍	❍	❍
Clerical and Sales	❍	❍	❍	❍	❍	❍	❍	❍
Service	❍	❍	❍	❍	❍	❍	❍	❍
Agricultural, Fishery, Forestry, and Related	❍	❍	❍	❍	❍	❍	❍	❍
Processing	❍	❍	❍	❍	❍	❍	❍	❍
Machine Trades	❍	❍	❍	❍	❍	❍	❍	❍
Benchwork	❍	❍	❍	❍	❍	❍	❍	❍
Structural Work	❍	❍	❍	❍	❍	❍	❍	❍
Miscellaneous	❍	❍	❍	❍	❍	❍	❍	❍

Q15. What is the typical level of education of candidates for the following occupational categories?

	Less than high school	High school diploma or equivalent	Some college	Two year degree	Four year degree	Professional degree	Doctorate	N/A
Professional, Technical, and Managerial	❍	❍	❍	❍	❍	❍	❍	❍
Clerical and Sales	❍	❍	❍	❍	❍	❍	❍	❍
Service	❍	❍	❍	❍	❍	❍	❍	❍
Agricultural, Fishery, Forestry, and Related	❍	❍	❍	❍	❍	❍	❍	❍
Processing	❍	❍	❍	❍	❍	❍	❍	❍
Machine Trades	❍	❍	❍	❍	❍	❍	❍	❍
Benchwork	❍	❍	❍	❍	❍	❍	❍	❍
Structural Work	❍	❍	❍	❍	❍	❍	❍	❍
Miscellaneous	❍	❍	❍	❍	❍	❍	❍	❍

Q16. When filling vacancies for water-related positions in the last three years, how long did the job positions remain vacant on average? Please exclude any mandatory vacancy requirements in your organization.

❍ Less than six months
❍ Six to 12 months
❍ 12 to 18 months
❍ 18 to 24 months
❍ More than 24 months
❍ N/A

Q17. Rank your preference when hiring for water-related positions (1=Most likely to hire) by dragging each option into the appropriate order.

_____ Current employee
_____ Inexperienced (in a water-related position) candidate
_____ Experienced (in a water-related position) candidate

Q18. Rate the level of importance of the following factors in making hiring decisions for water-related career positions requiring at least a bachelor's degree.

	Very important	Important	Neither important nor unimportant	Unimportant	Very unimportant	N/A
Candidate's characteristics	❍	❍	❍	❍	❍	❍
Candidate's attitude	❍	❍	❍	❍	❍	❍
Candidate's communication skills	❍	❍	❍	❍	❍	❍
Previous work experience	❍	❍	❍	❍	❍	❍
Recommendations from current employer	❍	❍	❍	❍	❍	❍
Recommendations from previous employers	❍	❍	❍	❍	❍	❍
University recommendations	❍	❍	❍	❍	❍	❍
Industry-based credentials	❍	❍	❍	❍	❍	❍
Years of completed education	❍	❍	❍	❍	❍	❍
Candidate possesses specified degree	❍	❍	❍	❍	❍	❍
Score on test administered as part of interview	❍	❍	❍	❍	❍	❍
Academic performance	❍	❍	❍	❍	❍	❍
Experience or reputation of candidate's school	❍	❍	❍	❍	❍	❍
Other	❍	❍	❍	❍	❍	❍

Q19. Which does your organization value more in candidates for water-related positions requiring at least a bachelor's degree: education or experience?

- ❍ Education
- ❍ Experience
- ❍ N/A

Q20. Considering recent candidates for vacant water-related positions in your organization, to what extent would you agree the following were factors influencing your decision NOT to hire.

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	N/A
Candidates did not fulfill necessary requirements	❍	❍	❍	❍	❍	❍
Candidates are not able to perform soft or interpersonal skills	❍	❍	❍	❍	❍	❍
Candidates are not able to perform basic skills required for their positions	❍	❍	❍	❍	❍	❍
Candidates are not able to perform technical skills specific to their water-related responsibilities	❍	❍	❍	❍	❍	❍
Candidates cannot pass the background check	❍	❍	❍	❍	❍	❍
Candidates are not hired because of results of controlled substance testing	❍	❍	❍	❍	❍	❍

Q21. Which key traits or skills are most lacking in candidates for water-related positions in your organization?

Q22. What is the organization's plan for the number of water-related positions in the next three years?

- ❍ Increase the number of positions
- ❍ Decrease the number of positions
- ❍ Neither increase nor decrease the number of positions

Q23. When does the organization plan to increase the number of water-related positions?
❍ Within 12 months
❍ Between one and two years
❍ Between two and three years
❍ More than three years
❍ N/A

Q24. List the factors influencing the organization's decision to increase the number of water-related positions.

Q25. By how many positions does your organization expect to increase in the following occupational categories?

	1-3 positions	4-6 positions	7-9 positions	10+ positions	N/A
Professional, Technical, and Managerial	❍	❍	❍	❍	❍
Clerical and Sales	❍	❍	❍	❍	❍
Service	❍	❍	❍	❍	❍
Agricultural, Fishery, Forestry, and Related	❍	❍	❍	❍	❍
Processing	❍	❍	❍	❍	❍
Machine Trades	❍	❍	❍	❍	❍
Benchwork	❍	❍	❍	❍	❍
Structural Work	❍	❍	❍	❍	❍
Miscellaneous	❍	❍	❍	❍	❍

Q23. When does the organization plan to decrease the number of water-related positions?
❍ Within 12 months
❍ Between one to two years
❍ Between two to three years
❍ More than three years
❍ N/A

Q24. List the factors influencing the organization's decision to decrease the number of water-related positions.

Q25. By how many positions does your organization expect to decrease in the following occupational categories?

	1-3 positions	4-6 positions	7-9 positions	10+ positions	N/A
Professional, Technical, and Managerial	❍	❍	❍	❍	❍
Clerical and Sales	❍	❍	❍	❍	❍
Service	❍	❍	❍	❍	❍
Agricultural, Fishery, Forestry, and Related	❍	❍	❍	❍	❍
Processing	❍	❍	❍	❍	❍
Machine Trades	❍	❍	❍	❍	❍
Benchwork	❍	❍	❍	❍	❍
Structural Work	❍	❍	❍	❍	❍
Miscellaneous	❍	❍	❍	❍	❍

Q26. List the constraints that prevent your organization from increasing the number of water-related job positions.

Q27. To what extent do you agree that QUANTITY of graduates in water-related areas is the limiting factor impacting opportunities for organizational growth?

❍ Strongly agree
❍ Agree
❍ Neither agree nor disagree
❍ Disagree
❍ Strongly disagree

Q28. To what extent do you agree that QUALITY of graduates in water-related areas is the limiting factor impacting opportunities for organizational growth?

❍ Strongly agree
❍ Agree
❍ Neither agree nor disagree
❍ Disagree
❍ Strongly disagree

Appendix B - Interview Protocol

Thank you for participating in this study, "Assessing Supply, Demand and Professional Development Needs of Employees in Water-Related Careers," as a part of my graduate degree program. The purpose of the study is to identify professional development needs for employees in water-related careers. Our discussion today will focus on your experiences hiring employees in water-related positions and your organization's expectations for potential employees in these positions. Our conversation should last about 45 minutes.

1. What abilities and characteristics describe the ideal applicant for your water-related positions?
2. What abilities do job applicants for water-related positions typically demonstrate well upon hire?
3. What ability gaps do you typically observe in job applicants for water-related positions?
4. How do you see the abilities needed for employees in your water-related positions changing over the next ten years?
5. What professional development opportunities does your organization currently provide for employees in water-related positions?
6. For which abilities would your organization prefer to train employees internally?
7. For which abilities would your organization prefer external sources provide training?
8. What does the organization do to reinforce the importance of professional development once the employee is in the workplace? (Or how are employees encouraged or rewarded for participating in professional development opportunities?)
9. How does your organization continually evaluate the employee's abilities to meet the needs of the position?
10. In your opinion, what steps – if any – need to be taken to address the supply of candidates for positions like those we've discussed?
11. In regard to anything we've discussed, what are you hearing from other organizations with water-related positions?

Additional probing questions may be incorporated as needed to help the researcher clarify questions or keep the interview on topic.