A Partnership Between a Midwest Community College and the Highly Regulated Power Production Industry: A Case Study Regarding the Development of an Energy Production Technology Program

Kenneth W. Flowers
*Western Michigan University*

Follow this and additional works at: [https://scholarworks.wmich.edu/dissertations](https://scholarworks.wmich.edu/dissertations)

Part of the Community College Leadership Commons, Educational Leadership Commons, and the Higher Education Commons

**Recommended Citation**


[https://scholarworks.wmich.edu/dissertations/1172](https://scholarworks.wmich.edu/dissertations/1172)

This Dissertation-Open Access is brought to you for free and open access by the Graduate College at ScholarWorks at WMU. It has been accepted for inclusion in Dissertations by an authorized administrator of ScholarWorks at WMU. For more information, please contact wmu-scholarworks@wmich.edu.
A PARTNERSHIP BETWEEN A MIDWEST COMMUNITY COLLEGE AND THE HIGHLY REGULATED POWER PRODUCTION INDUSTRY: A CASE STUDY REGARDING THE DEVELOPMENT OF AN ENERGY PRODUCTION TECHNOLOGY PROGRAM

by

Kenneth W. Flowers

A dissertation submitted to the Graduate College in partial fulfillment of the requirements for the degree of Doctor of Philosophy Educational Leadership, Research and Technology Western Michigan University December 2015

Doctoral Committee:

Richard Zinser Ed.D, Chair
Louann Bierlein Palmer, Ed.D
Brian Pyles, Ph.D.
A PARTNERSHIP BETWEEN A MIDWEST COMMUNITY COLLEGE AND THE HIGHLY REGULATED POWER PRODUCTION INDUSTRY: A CASE STUDY REGARDING THE DEVELOPMENT OF AN ENERGY PRODUCTION TECHNOLOGY PROGRAM

Kenneth W. Flowers, Ph.D.

Western Michigan University, 2015

With nearly every industry predicting severe employee shortages, the available worker pipeline, including the employed, may need to upgrade their skills. In addition, the number of jobs available will soon exceed the number of available workers, even if all the workers were skilled. This study investigated the perceptions held by key individuals within the energy industry regarding an Energy Production Technology degree program developed at one Midwest community college to help address worker pipeline issues in the energy industry.

This study discovered a void within present literature discussing the interaction between community colleges and the nuclear energy industry concerning the development and progress of new Energy program development. For the purposes of this study, it was essential to assess the feedback process within this partnership to determine if the program was yielding effective results as perceived by program graduates and their employers. Of particular interest, a significant piece of the study looked at how the students in the program perceived how well the program prepared them for the workplace, as well as the perceptions of the employers regarding graduates’ preparedness. Through open-ended interviews and surveys, this mixed methods case study includes the perceptions of 34 Energy Production Technology (EPT) program
graduates, seven EPT program advisory committee members, and four employers of graduates from the industry.

The findings revealed that the program was successful for creating a worker pipeline; unfortunately there were not enough jobs to go around for all of the graduates. There was also conflict regarding the success of the feedback loop between the student, employer, and advisory committee. The employers and graduates equally believed that the program adequately prepared technicians for employment but they also felt that the military recruits were better prepared based on the nuclear culture in which they work.

The study affects policy and practice in career and technical education (CTE) by continuing to support the current practice of linking CTE education to third-party certified curriculum while also validating that the program development process requires a clear vision, flexible leadership, and continuous feedback from all stakeholders.
ACKNOWLEDGMENTS

The achievement of a completed dissertation and Ph.D. are inherently never possible without the help of many; there are a lot of people to thank. First and foremost, I would like to thank my advisor and committee chairperson, Dr. Richard Zinser, for his guidance and support through the time of my dissertation research. Your constant resolve throughout this process was always a calming influence. To committee member Dr. Louann Bierlein Palmer, your continued pursuance of great work will leave an indebted impact. Although you may be feared by many, you have inspired even more. And to committee member Dr. Brian Pyles, you were the pillar of strength that set the tone for the base of this work. I will always truly appreciate the hours and hours you spent with me. You have become a dear colleague.

This venture would not have been started without my path crossing with Dr. Katherine Manley. Her personal quest to keep giving students a chance by always “throwing them back” is a constant inspiration. Starfish forever!

To my colleague and friend, Kevin Kreitner, no one pushed me more than you did. I will be forever grateful to you for making me get to the finish line. To my dear cousin Alan Flowers, if there was one single person that I wanted to get this done for, it was you. I am truly flattered by how proud you are of me. Thank you to Dr. Robert Harrison, for your backing and continued confidence in me. I will truly miss you when you retire. To Pat Hall, the “Dean of Deans,” you gave me my start in education and I will always be grateful to you for hiring me and starting me on this path. And to my
buddy, Marge Zibbel, it was you who said, “Ken, this would be a great dissertation topic.” Thanks for inspiring this process and for being a great friend.

Mom and Dad, thank you for instilling in me the value of hard work. It is your voices I hear every day when there is work to be done. To my son Austin and daughter Lindsey; I hope I inspire you as much as you do me. I am extremely honored to be your dad. Finally, to my wife Misty, the love of my life for the past 30 years. I cannot thank you enough for the many sacrifices you made as I chased this dream over the past decade. I definitely could not have done this without you. I love you.

Kenneth Flowers
TABLE OF CONTENTS

ACKNOWLEDGMENTS .................................................................................................................. ii

LIST OF TABLES .......................................................................................................................... viii

LIST OF FIGURES ......................................................................................................................... x

CHAPTER

I. INTRODUCTION .......................................................................................................................... 1

   Problem Statement ..................................................................................................................... 4

   Research Questions .................................................................................................................... 6

   Conceptual Framework .............................................................................................................. 6

   Locally Developed by Business and Industry Advisory Committee .................................... 8

   Program Meets Third Party Standards (NUCP) ................................................................. 11

   Develop an Energy Production Technology Program ...................................................... 13

   Employees’ Skills Meet Employer Needs ............................................................................. 14

   Setting, Methods, and Overview ....................................................................................... 15

   Rationale for the Study .......................................................................................................... 16

   Limitations and Delimitations .................................................................................................. 17

   Chapter I Conclusion .............................................................................................................. 18

II. LITERATURE REVIEW ............................................................................................................. 19

   Community College History ................................................................................................. 20

   Future of Community Colleges ............................................................................................. 23

   Community Colleges and Workforce Development ........................................................... 25
Table of Contents – continued

CHAPTER

Creation of Energy Advisory Committee ................................................... 27
Highly Regulated Energy Industry ............................................................. 34
Establishing a Pipeline for a New Workforce ............................................. 36
Need for Adequately Prepared Employees ................................................. 38
Chapter II Conclusion ........................................................................... 41

III. METHODOLOGY ........................................................................... 43

Research Design ................................................................................. 43
Selection of Subjects ........................................................................... 45

Group One ............................................................................................. 47
Group Two ............................................................................................. 47
Group Three ........................................................................................... 48

Data Collection Methods, Procedures and Instrumentation .................... 49
Confidentiality of Subjects ..................................................................... 51
Data Analysis Processes and Procedures .............................................. 52
Validation of Data ................................................................................ 54
The Researcher ..................................................................................... 54
Chapter III Conclusion ......................................................................... 56

IV. RESULTS ........................................................................................ 57
<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Question One</td>
<td>58</td>
</tr>
<tr>
<td>Data Reduction and Bracketing</td>
<td>58</td>
</tr>
<tr>
<td>Theme One: Program has Created a Worker Pipeline</td>
<td>60</td>
</tr>
<tr>
<td>Theme Two: Be Sure to Involve the Right Stakeholders</td>
<td>62</td>
</tr>
<tr>
<td>Theme Three: Program Not Adequately Preparing Graduates to Pass the Pre-Employment Test</td>
<td>64</td>
</tr>
<tr>
<td>Theme Four: Need a Better Understanding of Balance Between Labor Supply and Demand</td>
<td>66</td>
</tr>
<tr>
<td>Research Question Two</td>
<td>68</td>
</tr>
<tr>
<td>Theme One: Students are Well Prepared on Core Technical Skills</td>
<td>70</td>
</tr>
<tr>
<td>Theme Two: Individuals from the Military are Better Prepared</td>
<td>71</td>
</tr>
<tr>
<td>Theme Three: The Program Needs to Better Prepare Students for the “Nuclear Culture”.</td>
<td>72</td>
</tr>
<tr>
<td>Research Question Three</td>
<td>76</td>
</tr>
<tr>
<td>Chapter IV Conclusion</td>
<td>91</td>
</tr>
<tr>
<td>V. DISCUSSION</td>
<td>93</td>
</tr>
<tr>
<td>Summary and Discussion of the Findings</td>
<td>94</td>
</tr>
<tr>
<td>Research Question One</td>
<td>96</td>
</tr>
<tr>
<td>Research Question Two</td>
<td>105</td>
</tr>
<tr>
<td>Research Question Three</td>
<td>109</td>
</tr>
<tr>
<td>Strengths and Limitations of the Present Study</td>
<td>114</td>
</tr>
</tbody>
</table>
Table of Contents – continued

CHAPTER

  Recommendations for Future Research ......................................................... 115
  Implications for Educational Leadership and Core Technical Education .. 116
  Chapter V Conclusion .................................................................................. 119

REFERENCES .................................................................................................. 121

APPENDICES

  A. Advisory Committee Interview Script ......................................................... 142
  B. Employer Interview Script/ Checklist ......................................................... 144
  C. Student Survey .......................................................................................... 148
  D. HSIRB Approval .......................................................................................... 157
LIST OF TABLES

1. Crosswalk of Research Questions, Data Source and Analysis ........................................ 53
2. Employers’ Perceptions of Graduate Skills Preparedness .................................................. 74
3. Employers’ Perceptions of Nuclear Uniform Curriculum Program (NUCP) Core Fundamentals Preparedness ............................................................................................................. 74
4. Employers’ Perceptions of Students’ Overall Preparedness .............................................. 75
5. Students’ Perceptions of Instructional Content and Program Quality .................................. 77
6. Students’ Perceptions of Program Teaching Methods, Procedures, and Course Content ............................................................... 78
7. Students’ Perceptions of Related and Support Courses ................................................... 79
8. Students’ Perceptions of Program Work Experience .......................................................... 79
9. Students’ Perceptions of Career Planning Information Provided By the College ... 80
10. Students’ Perceptions of Job Success Information on Former Program Graduates ... 82
11. Students’ Perceptions of College Placement Services .................................................... 83
12. Two-Sample t-Test Assuming Unequal Variances: Q7A. Students’ Perceptions of College Placement Services ........................................................... 83
13. Students’ Perceptions of Program Occupational Instructors ......................................... 84
14. Students’ Perceptions of Instructional Support Services .................................................. 85
15. Students’ Perceptions of Instructional Lecture and Laboratory Facilities ...................... 85
16. Students’ Perceptions of Instructional Equipment ............................................................ 86
17. Students’ Perceptions of Instructional Materials ............................................................... 87
List of Tables – continued

18. Students’ Perceptions of Job Skills Preparedness .............................................. 88

19. Students’ Perceptions of Nuclear Uniform Curriculum Program (NUCP) Core
    Fundamentals Preparedness ........................................................................... 89

20. Students’ Perceptions of Overall Preparedness .............................................. 90
LIST OF FIGURES

1. Conceptual framework: Energy program development concept.................................. 8
CHAPTER I

INTRODUCTION

This study investigated the perceptions held by key individuals within the energy industry regarding an Energy Production Technology degree program at one Midwest community college. The intent of this Energy Production Technology program is to help fill the staffing needs beginning to happen due to retirements and a deemed lack of a skilled workforce in the region. This is supported by the Nuclear Energy Institute (NEI) in a report that stated, “Nearly 38 percent of the nuclear industry work force will be eligible to retire within the next five years. To maintain the current work force, the industry will need to hire approximately 25,000 more workers by 2015” (NEI, 2010, p. 2).

To address the projected shortage of energy industry professionals for the region it serves, the community college in this study, through a partnership with the local energy industry, developed an Energy Production Technology degree program to give local job seekers the opportunity to prepare for high-skilled, high-wage jobs in the energy field. This program was developed in part by following the curriculum outline that was developed by the Nuclear Uniform Curriculum Program (NUCP) created in 2007 by the Nuclear Energy Institute (NEI). The NUCP was developed to guide community colleges in helping power plants staff their future workforce, and is a standardized program for educating operators and technicians for jobs at nuclear plants (NEI, 2010). Since 2007, more than 40 community colleges across the United States have begun to partner with the nuclear industry to implement such a program to ensure that the colleges have the tools
needed to educate future nuclear workers, and that the nuclear industry is supplied with capable, highly trained workers for the future (NEI, 2010).

The NEI report (2010) stated that “to develop the next-generation work force, the U.S. nuclear industry is working with community colleges to recruit and train students in a standardized way for employment at nuclear utilities” (p. 2). Historically, the commercial nuclear industry counted on high-tech military programs to provide technicians for civilian jobs. The NUCP was created as a quasi-accreditation process that provided a link between the NEI and community colleges. Prior to 2007, there is little evidence of a concerted effort between the plants and the community colleges to engage in such a partnership.

The NUCP program requires a common curriculum on plant equipment and systems, science and mathematics, and technical electives in students’ chosen focus area (Chemistry, Operations, Health Physics Radiation Protection (HP/RP), and Maintenance). The NUCP process consists of a three-step approach for developing a degree program: quantify the need, determine the curriculum needed for the region, and implement the right number of programs in each region (NUCP, 2010). During these phases, local nuclear power plants work with nearby colleges to develop a gap analysis of education programs and assess the areas where gaps need to be filled. The plants also work with the colleges to determine the supply and demand needs of critical workforce areas. A pilot phase is then established to strategically implement the program (NUCP, 2010).

Regardless of NEI involvement, prior to the development of an energy-focused program, one of the concerns often unfamiliar to any college attempting to develop such a degree program is that the power production industry is highly regulated. According to
Laraia and Dlouhy (1999), “the laws and regulations are often complex and overlapping, involving several government ministries, departments, and/or agencies. These laws and regulations typically provide licensing of various aspects of the nuclear industry, government oversight, setting of standards (both technical and environmental), and protection of human health from radiological (and other) hazards” (p. 40).

The nuclear industry is also often characterized by a requirement for high overall skill levels and a high degree of safety. Safety is a preeminent concern in the nuclear industry, not only for its own sake, but also its sensitivity in terms of public perception and, formally, because of national and regional regulations and international agreements (Organisation For Economic Co-Operation And Development [OECD], 2012). Education and training are crucial to maintain the level of safety necessary for the plant to run successfully.

It also must be noted that public opinion affects the ability to see energy training, specifically nuclear energy training, as a viable career option, because support for nuclear power is on a continual rollercoaster. This is mostly attributed to public anxieties over health, environmental concerns, and worries about the safekeeping of nuclear plants. The 1979 partial meltdown of a reactor at Three Mile Island and the Chernobyl disaster in 1986 gave critics explicit examples of the potential instability of nuclear power plants (Burgess, 2010).

Although interest in new plants has gained some momentum in the United States, according to the Energy Information Administration (2010), “the last new plant completely built was in the 1970s” (para. 1). Not building any new facilities over the course of the last few decades has negatively affected the need or growth for training
programs. In addition, when the plants were built in the seventies, the workers who built the plants remained as employees and subsequently retired from them. The lack of turnover in conjunction with the plants’ “train your own” mentality resulted in a workforce that saw little need for the development of training or education programs within higher education (Reckline, 2010).

With the current potential for a loss of workforce due to retirement and the need for skilled employees, through the support of the NEI, power plants have determined that community colleges can become the next source for employees. As a result, fairly new Energy Production Technology programs are being implemented, yet it must be noted that prior to this study, no research of community college Energy Production Technology programs existed to help us understand the process of such implementation, and the impact these programs are having on students and employees.

**Problem Statement**

The purpose of this research was to determine the perceived success of an Energy Production Technology degree program within one Midwest community college created in partnership with its local business and industry service district (Energy Production Industry). It was essential to assess the feedback process within this partnership to determine if the program was yielding effective results as perceived by program graduates and their employers. Equally important was to determine the role played by the advisory committee that was developed to implement and provide oversight to the program.

According the American Association of Community Colleges (2012), “Community colleges are valuable in helping meet the needs of a competitive global
economy and advancing a state’s economic growth by providing services to business and organizations” (para. 3). The problem is that businesses and organizations in many career areas currently have a precarious need for filling multifaceted and challenging job vacancies. Unfortunately, there are too few individuals who have the necessary education and work experience qualified to fill these positions.

Therefore, one goal of community colleges is to ensure that the workers in the region they serve have the educational tools needed to survive in today’s job market. In order for any degree program to remain viable and relevant, it must prepare highly skilled individuals who align with the changing needs of a given industry. To do this, the labor force and educational organizations need to be structured around integrated education, training, and program evaluation processes (Government Oversight Office [GAO], 2008). For employers, this extended effort provides opportunities for recruiting and training new employees, additional skills for incumbents and potentially improving retention.

Assessing the success of a program is vital to provide the best service to stakeholders. According to Epstein (2005), “The stakeholder’s role is broader than being a customer of services, because the conditions citizens experience in the community and in their lives are affected by many things other than community services” (p. 27). A region’s ability to be competitive depends on the capacity of its workforce. To succeed in building that capacity, the strategic actions of all stakeholders must embrace the current and emerging changes in the economy. Success depends entirely on how community colleges, along with their region’s stakeholders, can effectively collaborate and bring collective resources to bear on the challenges facing them.
Research Questions

This study investigated the perceptions held by the stakeholders associated with the creation and implementation of the Energy Production Technology degree program at one Midwest community college. Specific research questions addressed by this study are as follows:

1. From the viewpoint of the business and industry advisory committee created to oversee an Energy Production Technology degree program:
   a. How effective is the feedback loop between the student, employer, and advisory committee in order to for the program to successfully maintain program outcomes as required by Nuclear Uniform Curriculum Program (NUCP);
   b. How successful was the program for establishing a pipeline for a new workforce; and
   c. What key lessons were learned?

2. From the viewpoint of the power plant employer, to what extent do they perceive that Energy Production Technology program graduates were adequately prepared for employment?

3. From the viewpoint of the program’s graduates, to what extent do they perceive they were adequately prepared for employment, and what program attributes most supported their efforts?

Conceptual Framework

The conceptual framework of my study centers around key concepts referenced in Chapter II. This study investigated the concerns, ideas, and recommendations for
understanding current practices or sustaining those that best meet the needs regarding development of an Energy Production Technology program at one Midwestern Community College. “From an historical standpoint, community colleges have shown substantial growth and importance in providing technical training” (Brock, 2010, p. 17). This viewpoint leads to the review of workforce development within the community colleges’ mission and, to a larger extent, a detailed look at the importance of their collaboration with business and industry through the development and effectiveness of advisory committees.

Through this collaboration, an internal lens investigated the perceptions of the advisory committee and the path toward program development. The impact a third party certification process via the Nuclear Uniform Curriculum Project has on program implementation, the advisory committee, and program development process was also examined. The strategy behind this conceptual framework, see Figure 1, is to make the advisory committee, third party program review process, and adequately prepared employees the central focus of establishing an energy program at this particular community college in regard to its development, evaluation, employer and student perceptions, and potential improvement.
As graduates become employed in the industry, it is important to evaluate the validity of the training that is provided by the college. A continual feedback loop of evaluation and improvement would be developed as both the college and industry review and adjust perceived curriculum and employment outcome gaps.

**Locally Developed by Business and Industry Advisory Committee**

When developing a new program at any college, there must be coordination across key state, local and stakeholder agencies. According to a report by MPR Associates (2010), “Development of programs of study includes analysis of current labor market information to determine which programs of study will truly result in high demand jobs, input from stakeholders that is genuine and sustained, and funds dedicated to both initial development of POS as well as sustenance through curriculum.
development and business and education input” (p. 15). Once these pertinent data are collected and reviewed, if validated, local business and industry partners in the community convene to form a program advisory committee to cultivate the program.

The assemblance of an advisory committee is a requirement by this state’s Office of Career and Technical Education and the Carl D. Perkins legislation. The legislation requires the college to establish and/or maintain a Career and Technical Education (CTE) advisory committee to provide input for the program (Department of Education [DOE], 2008) in order to receive funding to support the program. The members of the committee are volunteers solicited by the college who are willing to share their proficient knowledge regarding the requisite skills and competencies for their selected programs. The program advisory committee membership includes representatives from applicable businesses and industries that reflect the focus occupation. Committee representation includes persons from the local community, with the majority coming from business and industry (only business/industry members vote for recommendations), and when a meeting is conducted, the majority (of voting members) must be from business and industry. The list of advisors for this Energy Production Technology program included local energy employees, including both labor and management, directors of chambers of commerce, K-12 representatives, community college administrators, and faculty and university instructors. Another requirement of the state is that the committee is required to meet at least two times a year to discuss and evaluate the program.

Once the advisory committee is established, and meetings begin, a key requirement is to maintain a meeting history of the program though the meetings’ minutes. A committee secretary keeps the minutes and distributes them to the members
prior to the meeting for review. The meeting minutes and other advisory committee records are filed within the college’s technology department. The minutes are kept on a server indefinitely at the college in a location that is convenient for review by the public and the Carl D. Perkins staff during monitoring visits.

The purpose of the program advisory committee is to help guide and support the CTE programs it serves. The foundation of the committee is centered on advising, assisting, supporting, and advocating for career and technical education. Although, the advisory committee works cooperatively with college administration in planning and carrying out the committee’s work, the committee has no legislative, administrative, or programmatic authority. An advisory group may assist one specific CTE program, or if necessary several comparable programs. In order for this process to be effective, the advisory committee must have a clear understanding of the programmatic needs and ensure it has the necessary expertise to cultivate a plan of action, establish priorities for action, and target specific activities that have the most significant influence on the CTE program that has been identified.

This Energy Production Technology program advisory committee’s oversight of activities and responsibilities included, but are not limited to, review of program progress, status, and changes; identification of gaps and emerging issues; report of classroom observations; discussion of lessons learned; development, implementation, and maintenance of curriculum in compliance with ACAD 08-006 (nuclear curriculum standards); conducting of periodic program reviews; and development of strategies for growth of student success (DOE, 2008). The three main areas of focus for that were established by this particular advisory committee are curriculum, student success, and
developing a pipeline for a new workforce. Note: I, as the researcher, am a faculty member within this degree program and was involved in the program’s development, and therefore have knowledge and internal documents regarding factual information about this program. Sources were not listed for all such information since there were no formal documents available for such information.

Specific to this study, the Energy curriculum was originally broken into four different concentrations (Chemistry, Operations, Health Physics Radiation Protection (HP/RP), and Maintenance) based on the four hiring intake areas of the nuclear plant. Because of these multiple levels of curriculum activity, the Energy advisory committee met monthly for 3 years (2008-2011) during the development stages of the program. Since 2011, the committee has met quarterly to informally evaluate and discuss the program.

**Program Meets Third Party Standards (NUCP)**

In 2007, the U.S. nuclear industry launched the Nuclear Uniform Curriculum Program (NUCP), managed by the Nuclear Energy Institute (NEI). The NUCP is a standardized certificate program designed to ensure the workforce is trained and in place at the right time. The reason for the development of the NUCP was to quantify the need for nuclear plant workers, define industry-approved curriculum, and implement the right number of programs based on regional demand. As new plants are being built, coinciding with a large number of retirements from the nuclear energy industry, an industry priority is to train new workers. The industry-recognized NUCP certificates are awarded to students in one of the four specific concentrations, who receive a grade of B
or better in all core courses of that curriculum, along with diplomas from the two-year college programs.

The initial step to for the college to qualify for the NUCP certificate program was to perform a gap analysis of the curriculum. This investigation of the curriculum was performed by the area power plant and local community college. The comparative analysis compared the ACAD 08-006 requirements (name of approved nuclear curriculum), the core Energy courses developed by the college using the ACAD 08-006 objectives, and the Energy concentration-specific courses. The gap analysis was performed independently by the college’s instructional designer and the senior training instructor for the radiation protection program at the local nuclear plant. All concerns were discussed and resolved to the satisfaction of all parties. The Energy program began in the fall of 2011 with all gaps closed.

With the curriculum gaps being settled, for the final step, prior to issuance of the first NUCP certificates to each partnership’s first graduating class, a “challenge meeting” had to be successfully completed. This process is where the sponsoring utility or power plant and educational partner report out to an ad hoc challenge meeting subcommittee of the NUCP. The purpose of this meeting was to demonstrate to the NUCP group that the program and students have met all NUCP requirements. This is done by going through a rigorous self-study process and then defending the process to the ad hoc committee. Once approval was received from the challenge meeting subcommittee, certificates could be issued to eligible graduates.

A key benefit of the NUCP is that once graduates who earn this certificate are hired at the plant, they can be waived or exempted from portions of required initial
training. By evaluating and accrediting the community college training programs, this waiving or exemption of training is a cost-saving measure for the power plants allowing the plants to then redirect these financial resources to other areas. Organizing industry partnerships with two-year education programs helps leverage resources to provide the next generation of highly skilled workers (NEI, 2010).

**Develop an Energy Production Technology Program**

During the initial program development stages, the Energy Advisory Committee developed a strengths, weaknesses, threats and opportunities (SWOT) analysis to establish the capacity for offering this new program. According to Griffin (2011), “The SWOT analysis helps organizations identify their internal capabilities, as well as significant events and trends from the external environment” (p. 88). Bensoussan and Fleisher (2013) contended that “the analysis [SWOT] consists of both an external and internal component and provides management with an overview and understanding of the forces, trends, and characteristics of a particular market” (p. 201).

The strengths of the program developed by the internal analysis included strong support from local power generation industry, industry experienced adjunct instructors, strong base of potential workers due to manufacturing shortages, NEI pilot program, and strong government (and public) support for renewable energy. These strengths support the framework focus, centered around advisory committee (strong support from local industry), third-party program review process (NEI pilot) program, and adequately prepared employees (strong base of potential workers). The SWOT analysis confirmed the support for the program.
**Employees’ Skills Meet Employer Needs**

One of the key intents of the Energy Production Technology program is to prepare students to enter the workforce in an energy production area while also up-skilling those already in the workforce. In order to continue to meet these employer needs, as the program matures, it is important to sustain a feedback continuum in order to maintain program relevancy. For example, at the early stages of program development, based on feedback from employers and students, a key component missing from the program that limited students’ preparedness was that the college did not have lab equipment or a recognized lab space for one of the hands-on technical programs. Gaps were identified through instructor and student surveys that revealed this limited access to equipment. Initially, to use appropriate equipment, instructors would either schedule time at the plant or bring pieces to the class for students to use. This, at times, caused logistical issues for both students and the instructors.

To address the equipment issues, a 280-square-foot lab locked space was established specifically for the HP/RP program. The college received several pieces of donated equipment from two area nuclear plants and then purchased additional equipment and storage cabinets. The college invested $30,000 in inventory so that students would have a greater opportunity for a hands-on experience. Nearly 40 pieces of industry-relevant equipment were purchased to support this newly developed lab. The equipment purchased to support the curriculum for the HP/RP concentration was determined by a subcommittee of the Energy Production Advisory group. Their selection was based on a list of radiation equipment provided by the Institute of Nuclear Power Operations (INPO) from recommendations of a previously developed lab. These updates
would not have been possible without a feedback process sought out by the advisory committee.

**Setting, Methods, and Overview**

This study examined issues surrounding the Energy Production Technology program at one Midwest community college. A mixed method case study approach was the strategy of inquiry used for this case study. Characterized by an exploratory nature, this type of research seeks a more in-depth, detailed, and close-up view of a topic, collecting data with questions that typically begin with “how” or “what” (Creswell, 1998) and expressing data using words rather than numbers. The interview aspect of a case study can explore a specific experience shared by a relatively small number of people, purposefully chosen as a non-representative sample (Bogdan & Biklen, 2003), using a systematic yet flexible in-depth interview structure based on open-ended questions (Bogdan & Biklen, 2003; Burke & Christensen, 2004; Creswell, 1998; Marshall & Rossman, 2006; Patton, 2002). A mixed method case study was chosen for this study because of the opportunities to interact with subjects on a human-to-human basis, to explore further, if necessary, using follow-up questions, and to arrive at conclusions post hoc rather than a priori (Creswell, 1998; Lancy, 1993). Kahn and Cannell (1957), as quoted in Marshall and Rossman (2006), described the in-depth interview as a “conversation with a purpose” (p. 101) employed to discover the perspective of the phenomenon from the point of view of the subject.

In-depth interviews were conducted with advisory members and employers associated with the program. Such a strategy allowed the researcher to explore the subjects’ perception of the Energy Production program to a greater depth. Additionally,
online surveys were be used to capture the perceptions of the program graduates. Data was analyzed and organized into themes and patterns consistent with the conceptual framework.

**Rationale for the Study**

One objective of the research is to examine how a program may be evaluated and improved, if necessary, by collecting input from program graduates and their employers. Meeder (2008) stated, “There is clearly a need for stronger programmatic connections between high schools, adult education, and community colleges and the labor market to both respond to, and anticipate, the needs of the high-skilled workforce” (p. 11). Undertakings like the creation and implementation of an Energy Production Technology program using the Nuclear Uniform Curriculum Project (NUCP) may provide such connections.

According to Bunn and Stewart (1998), “Building partnerships at national, state, and local levels provides a mechanism for broad industry and education acceptance of the standards. Avenues must be opened and dialogue within and among all partners must be strengthened” (p. 10). Based on dialogue from industry, community college provides workforce training based on industry standards that helps individuals move from being unemployed or underemployed to becoming in demand skilled workers that employers are looking for. While employers across the spectrum continue to have critical issues filling job openings that are increasingly intricate and challenging, unfortunately not many individuals have the skills necessary to fill these positions.

This study is significant because it examines aspects of a new relationship and training opportunities between the energy industry and a community college. While the
literature suggests that all community colleges develop and deliver some type of workforce development training and educational programs, little is mentioned regarding how community colleges are identifying, developing, and evaluating new programs within the nuclear energy industry. By understanding the needs and wishes of the highly regulated energy industry, colleges can provide their constituents an education that is better adapted to the region.

**Limitations and Delimitations**

According to Creswell (2007), all research studies have limitations and a finite scope. “A discussion of the study’s limitations demonstrates that the researcher understands this reality. It is important to describe the extent to which you believe the limitations degrade the quality of the research” (Marshall & Rossman, 2009, p. 42). Because the Energy Production Technology program examined in this study is a new program to the state of Michigan, limitations could stem from the lack of comparison programming because there currently is only one other program in the state.

The main subjects of the study are the program graduates, and the power plant personnel and advisory members associated with the program. These groups provided key data but inherently caused some limitations. For example, one such constraint is that some results of the study are uniquely dependent upon the interaction between the respondents and the researcher. The participants were purposefully chosen, and these findings cannot be generalized to the entire population. Limitations are often imposed by time and budget constraints. The time frame and number of questions asked are also a concern regarding effective data collection. Unprofessional moderating can also lead to inaccurate conclusions.
Overall, this study is subjected to the following limitations and delimitations:

1. This study is limited by the participants’ willingness to respond accurately to the voluntary surveys.
2. This study is limited by the small population size involved in the study.
3. This study is delimited to only local business and industry within one college district.
4. This study is delimited to only business and industry that are participating or have participated in workforce training with in the past 5 years.

Even though the study was narrow in scope, it provided a depth of data that may be meaningful for the stakeholders.

**Chapter I Conclusion**

The main goal of this study was to add to the literature information that will be beneficial regarding the development of successful training and partnership opportunities. Another objective of this study is to determine how a college can engage with local business and industry, and how this type of engagement might be replicated. The results of the study are intended to better inform the college in order to enhance the role of workforce training in this area. Results from this effort may produce recommendations that can enrich and heighten the training provided by the college to the region. This study provided the college with information regarding the improvement, implementation, and development of a successful energy training program that incorporates communication with local business and industry.
CHAPTER II
LITERATURE REVIEW

This study investigates the perceptions held by individuals regarding the success of an Energy Production Technology degree program at one Midwest community college. The study focuses on the interaction between the college and the local leaders in the energy industry that comprise the energy advisory committee concerning the progress involved regarding the procedures of new program development.

The issues reviewed for the purpose of framing and justifying the research are the need for the power plants to partner with community colleges, through the use of an advisory committee, to find a productive work force; the issues faced by the community college in regard to working with a highly regulated industry and their third-party accreditation process; and the need for adequately prepared, highly skilled technicians to replace nuclear workers who are reaching the age for retirement.

In order to frame the research, this chapter, in alignment with the research questions, consists of related literature that looks at several viewpoints. The first section reviews, from an historical standpoint, community colleges and their educational growth and importance in providing technical training, and expands to the creation of occupational programming through the use of advisory committees. This viewpoint then leads to the review of workforce and workforce pipeline development within the community college’s mission and, to a larger extent, a detailed look at the importance of its collaboration with business and industry. Because this study looks at the energy industry, there is also a review of the industry and its third-party certification. The nuclear energy industry, much like community colleges, gained prominence in the 1960s,
but both have gone in different directions. This review of the literature identifies a lack of interaction over the years between community colleges and the nuclear industry regarding the development and evaluation of instructional programming.

**Community College History**

From a historical perspective, the development of community colleges and their implementation speaks to why their partnership with local business and industry is sought after for development of programs such as Energy Production. In the beginning of the 20th century, the United States had issues regarding educational access. This, coupled with the growth of industry, propagated a need for a better skilled workforce. Although the previous 100 years witnessed the evolution of private schools and colleges, those educational opportunities were generally isolated for the wealthy and privileged.

According to Brint and Karabel (1989), “As schools became more relevant to economic success and correspondingly more attractive to ambitious men and women during the early 20th century, popular demand for the expansion of education intensified” (p. 8). Brint and Karabel contended that “probably the simplest overarching reason for the growth of community colleges was that an increasing number of demands were being placed on schools that every level” (p. 1). With the market being ripe for new growth, social issues supported the expansion of the community college as well: parents wanting to keep their children closer to home, children graduating from high school wanting to increase their education but not having to leave their community, and leaders wanting to strengthen local business and industry. This is supported by Burns (1979), an expert on the study of leadership, who believes that “an effective leader will bring together supporters in a shared vision that will improve an organization” (p. 12).
According to Dougherty and Townsend (2006), “Community colleges are the great American education success story of the 20th century” (p. 1). In terms of sheer numbers, no other 20th-century organizational innovation in higher education even begins to approach the success of the two-year college, which grew from a single college in 1901 to 1,200 institutions in 1980 representing almost 40% of America’s 3,231 colleges (Brint & Karabel, 1989). Very few Fortune 500 companies can show that kind of growth on their balance sheets. The community college and its place as an important part of the “educational cog” was evident.

Based on sheer numbers, while establishing the ability to grow, over the course of their first 100 years community colleges have been generally nimble in response to demands of the times. This concept is confirmed by Bailey and Morest (2004), who stated that “being nimble is a main reason community colleges have been able to recognize so much growth” (p. 30). According to Mulienburg,

Community colleges are perhaps the most nimble of all the sectors of American higher education. In a recessed economy, nimbleness can be an indicator of efficiency and resilience, a characteristic that Time Magazine equated with the ability ‘to tack quickly in changing winds.’ (p. 2)

The ability to be nimble and quick to respond is what led the local power plants to look to the college for programming in the first place. The college in this study was contacted in January 2008 about developing a workforce pipeline, and in September of the same year had a program with over 100 students in it. That is the type of response needed to get full support of local industry.
Although being nimble is important, providing access to essential programming with an opportunity for job growth is also a driver for community colleges. An associate degree permits the community college graduate to almost double the average annual earnings of high school dropouts ($37,990 compared to $19,915) (NCCC, 2008, p. 6). Milanovic, a World Bank economist, added in a recent article, “Widespread education has become the secret to growth. And broadly accessible education is difficult to achieve unless a society has a relatively even income distribution” (GOP Website, 2011, para. 14). Even a one-year certificate will increase a graduate’s annual earnings by 17% above that of a high school graduate (American Association of Community Colleges [AACC], 2011). Along with access to job training, a community college education offers individuals additional career opportunities and higher earnings.

Sustained support of the community college to the region it serves is also apparent according to a report from the National Commission on Community Colleges (2008):

Community colleges are skilled community builders, often the conveners of local community life. In naming these institutions, the use of the term “community” was no accident. Although the needs of the many communities in the United States are diverse and change over time, an effective community college must see itself and be seen as an institution dedicated to serving the needs of its community, whatever those needs may be. (p. 6)

Invariably, the needs of community college students are diverse. One third of them seek skills and certificates that qualify them for employment. Twenty percent want to upgrade themselves and jobs they already hold, and 10% are attending strictly for their general personal interest. An additional one third want to earn credits to be transferred to
a four-year school for the bachelor’s degree (Cohen & Brawer, 2003). The challenge, according to Soares (2013), “is designing education experiences that make sense given the students’ life realities and what they want out of a community college education” (p. 8). Soares contended, “Community colleges have the scale, pedagogical diversity and access to the student body to improve the postsecondary attainment of many Americans, but they must find ways to integrate their three missions to do so” (p. 8).

These multiple missions, on top of developing strong industry partnerships that result in effective workforce development programs, frame the need for researching communication and program evaluation processes that continue to help the local region. Research has shown that community colleges can be an effective and proven force in the area of workforce development. What has not been clearly developed is what “best communication practices” have been established regarding the partnerships created between community colleges and the local energy industry in regard to program development and evaluation.

**Future of Community Colleges**

According to an analysis done by the National Commission of Community Colleges (NCCC), there are four “megatrends” that are reshaping the United States. They are the growing economic vulnerability of the United States, challenges to the stability of the middle class and social mobility, dramatic changes in the nation’s demographics and population, and the imperative to rebuild the capacity and vigor of our nation’s schools and communities (NCCC, 2008, p. 25). In terms of economic vulnerability, the analysis indicates that half of the new jobs created in the United States in the next 10 years will require at least some postsecondary education. Even in high-demand science,
technology, engineering, and mathematics (STEM) fields, the role of community colleges is critical. To meet the nation’s needs in STEM fields, the United States should plan on a 25.1% increase in the number of associate degrees awarded and a 19.7% increase in bachelor’s degrees awarded (NCCC, 2008, p. 10).

To help ensure that their programs are demand-driven, community colleges use a variety of methods to continually gather and analyze labor market information and conditions. In a study done by the U.S. Government Accountability Office (GAO, 2008), each school visited cited labor market analysis as an important way to identify local needs and trends. In addition to gathering information about local labor market trends to maintain their existing programs, community colleges also use this information to create new programs and, in some cases, to discontinue programs that no longer meet local needs. The shortage of workers has shifted from one of quantity to one of quality. Wolfe (2006) believed that, “Rather than focusing on specific technologies or specific problems, we need to equip students with those concepts that are common to all problems, all technologies, all skills, ranging from workplace engineering to ethics to entrepreneurship” (p. 11).

My study places emphasis on community colleges and the impact they make in the communities in which they reside. A perspective on the role workforce development plays also helps to frame the research. Over the latter half of the 20th century, the goal of workforce development policy in the United States has been to improve the job prospects and salaries of low-income and lesser educated workers (Stoll, 2004). Workforce development is a term that can be described as “activities that build the capacity of both
individuals and companies” (Harris & Short, 2013, p. 3). One of the strengths of the community colleges is their connectedness to the workforce community.

**Community Colleges and Workforce Development**

According to Katsinas (1994), “Workforce development is designed to enhance the skills of people to gain or maintain socioeconomic status” (p. 24). Because they are regionally located, community colleges can provide training that targets the needs of local business and industry. Community colleges offer a wide array of educational programs that encompass traditional academic coursework as well as career and technical training. In addition, career and technical education programs are offered on both a for-credit basis and a noncredit basis. An advantage of noncredit courses is that colleges can add or delete them more quickly than for-credit courses, thereby allowing colleges to respond to local training needs in a more responsive way (GAO, 2008). The quick response method of training provides a short-term response to workforce pipeline needs, while the traditional academic approach fills the long-term necessities.

Oates (2011) stated that

the 21st century economic landscape is rapidly changing with innovation, technology, and globalization altering the nature of work, and the skills and training needed by workers to compete in the workforce. Today’s economic realities necessitated the publicly funded workforce system serving youth be aimed at preparing them to secure jobs in high-demand industries in occupations.

(p. 2)

This statement directly aligns with the missions of most community colleges today. Community colleges have the advantage of being able to tailor programs to local needs
and state requirements and to use approaches that will be most acceptable to workers and the community (Institute of Medicine, 2011). Leigh and Gill (2007) indicated that historically, community colleges concentrated on two missions—supplying introductory college level courses to students interested in transferring to a four-year college or university, and providing occupational training intended to equip program graduates with skills needed for jobs in the local labor market. (p. 1)

Over time, community colleges have broadened their missions to include adult basic education and workforce development (Leigh & Gill, 2007). Leigh and Gill (2007) further suggested that “the broadening of community college missions to include workforce development has met an expanded role for the local business community and government officials in curriculum development” (p. 1). Oates (2011) voiced that “creating partnerships and the time of limited resources is critical to providing the most effective, targeted, an appropriate services that can help youth identify and successfully progress along a clear pathway” (p. 3).

Harrison (2008) stated, “In order to meet the demands of the 21st century economy, the public workforce system must develop collaborative partnerships between employers, labor representatives, business, industry, and educators to promote economic development in communities across the nation” (p. 2). According to Stoll (2004), “No single organization usually has the internal capacity (size, resources, equipment, facilities, access to clients, and expertise) to complete the training process from beginning to end: thus collaboration is necessary for success” (p. 204). The key to efficient alignment between workforce and economic development professionals is collaboration. Whether the collaborations include few or many, leadership and buy-in at the highest
administrative levels are fundamental to lasting effectiveness. The more stakeholders who commit to collaboration, the better the opportunity for sustained economic growth will be (Rothwel & Gerity, 2008).

**Creation of Energy Advisory Committee**

“When we set a concrete objective and determine a definite road map for getting there, it can be transformational” (McGinnis, 1985, p. 88). As the college involved in my study was set on “getting there,” it was important that local subject matter experts be involved. Industrial training programs are vital parts of the communities they serve, so it is necessary to have close cooperation between the college and local employers. A main communication connection between local employers and the college has been through the use of advisory committees. Based on a review of several advisory committee handbooks by the Workforce Development Association (WDA, 2013), a common theme prevailed:

One of the most common characteristics associated with high-quality technical/occupational education programs is their close ties with business, industry, and labor. The purpose of the program advisory committee is to establish and assist in program improvement. The committee’s purpose is to advise and serve as the link between the school and industry. As the programs must stay as current as possible, industry representatives on the advisory committee perform a service to the school and students by providing advice on all phases of the program. (p. 3)

The intent of an Energy Production Technology program is to prepare students to enter the workforce in an Energy production area while also upgrading the skills of incumbent workers. An Energy advisory committee was established to help the college ensure that the program reflects the changing needs of students, employees, business and
industry, and the community. The key to the success of this committee was the commitment of the external community members, as well as participating educational administrators and faculty members. Much like understanding the historical development of community colleges, it is equally valuable to appreciate the evolution of the development of the advisory committee in order to better comprehend the current participation of program advisory committees at the college.

A requirement of program advisory support for community college programs was born in an amendment in 1968 to the Vocational Education Act (VEA). The amendment required each state to develop advisory groups to ensure the implementation of state legislation while providing feedback regarding program curriculum (Vocational Education Amendments of 1968). The VEA was amended again in 1976 to help the colleges with program enrollment projections while also providing membership guidelines. The amendment stipulated the use of labor market information input by the committee to verify potential future employee needs while ensuring membership had equal participation amongst business and education (Vocational Education Amendments 11 of 1976). Further expansion of the VEA was done in the Carl D. Perkins Vocational and Technical Education Act of 1984, which continued the mandate of advisory committee input while providing a more pronounced scope of requirement.

Several researchers reviewing advisory committees have commonly used Riendeau’s (1967) research as a basis to examine advisory committee structure. In his research, Riendeau surveyed 60 junior colleges regarding the function of occupational advisory committees. His study produced the following list of nine advisory committee functions:
1. Serves as a communication channel between the college and community occupational groups;
2. Lists the specific skills and suggests related and technical information for the course;
3. Recommends competent personnel from business and industry as potential instructors;
4. Helps evaluate the program instruction;
5. Suggests ways for improving the public relations programs at the junior college;
6. Assists in recruiting, providing internships, and in placing qualified graduates in appropriate jobs;
7. Keeps the college informed of changes in labor market, specific needs, and surpluses, etc.;
8. Provides means for the college to inform the community of occupational programs;
9. Assesses program needs in terms of the entire community. (p. 28)

Riendeau’s study was supported by studies done by Cuninggim (1985), Behymer (1977), Kutscher (1982), and Lattier (2009) that found evaluation, communication, and recruitment as the principal functions of advisory committees. Additional responsibilities of committees included fundraising, course content, course outcomes, and curriculum development. Conroy’s (1996) research suggested that strong leadership provided by the community college is advantageous toward the success of the advisory committee. Based on a literature review of community college advisory committees, their common functions are to identify workforce needs, recommend skills sets, review (validate) curriculum, collaborate with stakeholders and constituents to promote public relations, raise funds, recruit personnel, and evaluate the program. This is quite significant because, as Grubb and Stromsdorfer (1997) stated, “Change can often occur so rapidly
that it is difficult for faculty to stay current with innovations in their field without guidance from those within the industry sector” (p. 3).

According to Miller (1987), “Advisory committee members are expected to base their judgments and related suggestions on their knowledge of program goals, methods, and successes, as well as on the expertise and background they bring to their work on the advisory committee” (p. 281). Mercer (1990) supported this by affirming that “an effective advisory committee provides ongoing evaluation and consultation on the curriculum to current knowledge, skills and attitudes, and values identified by industry” (p. 1). Both Miller and Mercer believed that these contributions are necessary for students to learn and use in order to work and be effective in their chosen fields.

Hightower (2006) suggested using advisory committees through a “focus group” approach (p. 2). This method was more “action item” focused, involving a minimum amount of meetings to focus on specific topics to address. Meetings by this group are concluded once the objectives are met. Through member recommendations, other local subject matter experts are solicited to create a new committee to focus on new tasks. This keeps a fresh viewpoint while getting things done.

Another key point advocated by Miller (1987) is that, theoretically, another purpose for the advisory committee is program evaluation, because of the evaluative essence of the group. As legislated by the VEA and then the Carl D. Perkins Act, the group is expected to make recommendations based on the strengths, weaknesses, and other key components of the program and then provide direction. Additionally, Myers (2008) wrote that a “variety of studies have confirmed that advisory committees are a ‘critical friend’ to the college when implementing a program” (p. 31). “The committee is
responsible for analyzing the program and offering advice on both the successes and the failures that the program is experiencing” (Myers, 2008, p. 32).

Zinser (2003) also supported the advisory committee role of an evaluator as a way to create potential market share. “To establish position as the preferred supplier, the community college must evaluate its programs on specific outcome variables agreed upon with their business partners” (para. 4). However, an unfortunate issue pointed out by Zinser is that

there is very little research on evaluating individual programs from the perspective of employers. Research is probably being conducted informally, by advisory committees, for example; but because the issues and decision making are largely a local affair, the results may not be published. (para. 5).

This speaks to the fundamental importance of the need for both advisory committees and continued program evaluation.

The college’s Energy Production advisory committee first met and was formed in April 2008. The membership of the Energy Production advisory committee included several individuals from the local power-producing plants, school districts, workforce investment boards, and the college. Several topics discussed during the initial meetings required specific work and action items be completed. Subcommittees were created as necessary to work on these areas. Below is a chronological list of the events that led up to the development and beginning of the Energy Production Technology program through the leadership of the advisory committee:

- January 2008: The college met with officials from two local power plants to discuss the employment needs of the prospective plants.
• April 2008: The first official Energy Production advisory meeting was held. The purpose of the group is to oversee the development of the Energy Production Technology program.

• May 2008: The local power plants and the college announced the offering of a new Energy Production Technology degree program. To gauge local interest, the college and energy industry experts hosted free information sessions about the program for prospective students. Combined, almost 300 local residents attended the events.

• June 2008: The United States Nuclear Regulatory Commission (NRC) awarded a $90,000 grant to the college to fund scholarships for its new Energy Production Technology program.

• August 2008: Representatives from the Energy advisory committee met with Institute of Nuclear Power Operations (INPO) officials to discuss the college’s participation in the Nuclear Energy Institute’s pilot Nuclear Uniform Curriculum Program. Because of the potential benefits of being part of the pilot program, there was unanimous agreement that the college would agree to participate. Fall 2008 semester began with almost 100 students enrolled in the Energy Production Technology program.

• September 2008: Energy advisory officials meet with local Intermediate School District (ISD) representatives. The purpose of the meeting was to discuss the process of establishing a new high school Energy Academy for the Fall 2009 semester. The proposed Energy Academies were to be held at three
separate regional locations. The nuclear energy plants were in support of the academies, which could help create a base of future employees.

- December 2008: Three new Energy Academies were presented, to be held at three separate college campuses. One campus also housed an academy that would focus on wind energy.

In addition to energy production, the Energy Production Technology program also birthed other energy-related opportunities. In collaboration with another local energy partner, the college developed a program to train utility workers for transmission and distribution maintenance. Green construction courses were also developed to include methods and materials needed to erect “green” buildings for homes and businesses.

Based on input from the advisory committee, the Energy Production Technology curriculum focused on four concentrations: Operations, Radiation Protection, Maintenance/Crafts, and Chemistry. Each concentration offers specific hands-on tools required to mirror the work done in the field. Courses were developed to meet the standards set forth in the Uniform Curriculum Guide for Nuclear Power Plant Technician, Maintenance, and Non-licensed Operations Personnel associate degree programs published by the National Academy for Nuclear Training that provides oversight for training at the nation’s nuclear power plants (NEI). Much of this core content is fundamental to plant operation without regard to the fuel source. Although the core curriculum contains content that is common to electrical power production regardless of the type of fuel used, the initial courses were based on a standard curriculum developed by the nuclear power industry. Because of the enormous interest in alternative energy, the Energy program is also looking to expand upon the current core concentrations.
Options include a concentration to prepare technicians to work with alternative energy production in wind, solar, and biofuels.

**Highly Regulated Energy Industry**

The nuclear energy is a highly regulated industry. The laws and regulations are often complex and overlapping, involving several government ministries, departments, and/or agencies. In many countries, individual states, provinces, and/or regional governments may also be involved in the regulatory process (Herne Data Systems Ltd., 2009). The laws and regulations typically provide licensing of various aspects of the nuclear industry: government oversight—setting of standards (both technical and environmental), and protection of human health from radiological (and other) hazards (Herne Data Systems Ltd., 2009).

The unique features of nuclear energy and its procedures present distinctive requirements for the education and training of its workforce. A knowledgeable and skilled workforce is essential in order to implement the safe operation of all nuclear faculties as well as continuing nuclear research and development. The importance of this training starts even before a new plant is built. The plant build planning requires a significant undertaking that includes its safe operation, continued maintenance and in time subsequent decommission.

In nuclear energy, the importance of safety training is exacting. Safe behavior skills are considered as critical as the specific technical competencies required for the job. Managers and leaders have a key role to model appropriate behaviors and to support nuclear education and training in order to generate and maintain a robust safety culture. It is useful to recognize that there are various degrees of “nuclearization” within the
industry, that is, the extent to which specific nuclear skills and safety culture training are needed to complement other engineering or management skills (OECD, 2012).

Throughout the workforce, general nuclear awareness is a prerequisite, with more specialized nuclear expertise being required by fewer personnel, depending on the specific job requirements.

A threefold categorization of the competencies (OECD, 2012) necessary to run a nuclear power plant can be drawn, which includes:

- “nuclear” people with a specialized formal education in nuclear subjects (e.g., nuclear engineering, radiochemistry, radiological protection, etc.);
- “nuclearized” people with formal education and training in a relevant (non-nuclear) area (e.g., mechanical, electrical, civil engineering, systems) but who need to acquire knowledge of the nuclear environment in which they have to apply their competencies; and
- “nuclear-aware” people requiring nuclear awareness to work in the industry (e.g., electricians, mechanics, and other crafts and support personnel).

It also must be noted that public opinion also affects the ability to see nuclear training with the support for nuclear power being on a continual rollercoaster. This is credited to public anxieties over health, environmental concerns, and worries about the safekeeping of nuclear plants. With the general public being mostly interested in sufficient supplies of reasonably priced energy and in the protection of public health and the environment, nuclear power has given some communities cause for concern.
Establishing a Pipeline for a New Workforce

In 2007, the nuclear industry had few ideas where it could recruit workers qualified to operate these plants. “Not only is the industry heading toward a retirement cliff, but there’s no safety net of new recruits or midcareer engineers behind them” (Testa, 2007, para. 2). Historically, the commercial nuclear industry counted on high-tech military programs to provide a way to fill these civilian jobs. According to NEI’s 2010 Work Force Report (2010), “In the early 2000s, only a handful of U.S. community colleges offered career programs to train nuclear industry workers” (p. 2). According to Reckline (2010), “The steady stream of potential candidates the industry once relied on has evaporated. This can be traced to military cuts begun in the 1990s and a heavy dependence on National Guard and reserve troops today” (p. 1). This combination of cuts in high school programs and training in an area historically dominated by the military has opened up great opportunities for community colleges to step in for training.

The concept of using community colleges for employment training is supported by MacAllum and Yoder (2004). In their report, The 21st-Century Community College: A Strategic Guide to Maximizing Labor Market Responsiveness, they advocated that since they are mutually dependent of each other, community colleges build tactical partnerships with business and industry in order for all stakeholders to flourish. Based on personal experience with this, although community colleges require faculty to participate in advisory committees, there is rarely enough staff devoted to maintaining relationships with local employers. An additional hindrance to most community colleges is their lack of research capacity for conducting their own regional economic analysis and that would help foresee the change of focus in this area. To make up for this, in many cases,
relationships are based on informal contacts between individual college administrators and, in particular, between faculty and local employers. The outreach is based on a “who you know” type policy. In the absence of staff with explicit outreach functions, colleges encourage individual initiative of this type (MacAllum & Yoder, 2004).

*Community College and Industry Partnerships* (CCIP) included many promising “good practices” for helping the populations they target, yet there is still research and analysis work needed to establish best practices that can be fully scaled (Soares, 2013). Soares stated, “For community colleges and industry partnerships to become an institution transforming catalyst in the community college system, they cannot be viewed primarily as an outgrowth of the vocational training function of the community college” (CCIP, 2013, p. 14). For example, one key partnership that has been a great help to the community college is the effective use of part-time faculty hired from local industry. Although there is more research needed to be done, Zeidenberg and Bailey (2010) contend that

- strategic use of part-time faculty who are working in the local labor market, and
- using a hiring process that seeks full-time faculty with links to local employers,

are important components of efforts to improve the workforce development function of the colleges. (p. 15)

The community colleges that hire adjunct faculty who are currently employed in their applicable industry are able to gain some key advantages. The industry relevant instructors are able to pass on their real world practical know how, and better yet, they are there because they want to be not because they have to be.
While the use of nuclear power as a clean energy source is on the rise, the reality is that actual growth has been somewhat sluggish. Although interest in new plants has gained some momentum, the last new plant completely built in the United States was in the 1970s (Energy Information Administration, 2010). The lack of new facilities has affected the need for or growth of training programs. But with the massive potential for a loss of workforce due to retirement, the plants have determined that community colleges can become the next source of employees.

Need for Adequately Prepared Employees

In his book, *The Labor Storm*, Wolfe (2006) provided a clear warning about future worker shortages. He contended that in interview after interview, leader after leader has shared that finding skilled and semi-skilled workers is becoming more challenging than ever. Wolfe provided statistics that stated the number of U.S. workers between ages 55 and 64 would grow 51% to 25,000,000 by 2012, meaning the fastest-growing portion of the workforce is the one that has the most risk of retiring soon. At the same time, the number of workers between ages 35 and 44 is expected to shrink by 7%. Wolfe provided examples comparing the workforce in 1955 to the workforce of today. In 1955, 40.5% of the U.S. workforce was engaged in manufacturing, construction, and mining, whereas well today those industries employ only about 15.8% of the workforce. The dilemma is, according to Wolfe, that despite the need to change, two thirds of employers said that the public school students don’t have the basic cognitive skills to succeed. With nearly every industry predicting severe employee shortages, the available worker pipeline, including the employed, do not have the right skills. In addition, the
number of jobs available will exceed the number of available workers, even if all the workers were skilled.

The concept of “skilled worker shortages” becomes more escalated as budget dollars for educational programs are limited. Owens (2006) stated that the United States spends a far smaller percentage of its national budget on education than other developed and developing nations. Not only do we lack the skilled workforce we need: we are accumulating masses of dysfunctional citizens who imperil our society. (p. 14)

A looming concern regarding the scarcity of dollars and its effect on the skilled trades, the U.S. has seen high schools shutter skilled trades training programs and shift their attention to preparing students for the University track. For example, thirty years ago, in Berrien County every public high school in the county’s 14 districts had a machine shop program. Today, based on my personal knowledge, there is only one. The problem here is multifaceted. First, when these programs are not in the high schools, unless there is a relative in the family that works in the field, students are not aware of the career possibilities. Secondly, these programs are expensive, and once they go away, they are typically not coming back. Finally, there is a negative social stigma regarding skilled trade’s careers. The focus has changed to, go to college, get a degree and by doing this, you are ensured a better future with greater access to employment. But just as attaining skillsets to become a machinist or welder is not for everyone, neither is pursuing a 4-year degree.

Careers in Energy are high-skilled and high-wage, yet a future workforce shortage may be on the horizon. “We often ask, ‘What's wrong with this generation? They don’t
have any work ethic?’ but a deeper analysis shows they haven’t had the same
employment opportunities their parents and older siblings once had” (Borjas, 2006, p. 56). As a result, employers are finding that entry-level employees are lacking in what defines “the habits of paid work.”

A summary report from the International Atomic Energy Agency (1999) stated:
Demographic and economic factors potentially challenge the continued safe and reliable operation and maintenance of nuclear power plants. Because many of the workers currently operating and maintaining power plants are reaching retirement age, the plants will be losing the people who were responsible for their commissioning and initial operation. Collectively, these factors mean that, in many states, it is difficult to attract people into the nuclear power industry. (p. 1)

In an interview with a local news agency, Savage (2008) stated:
No new nuclear plants have been built in the United States in the past 30 years. Increased demand in the industry and retirements locally spurred the two companies to work with the local college to develop local training. (MLive, 2008, para. 4).

Not only will Energy training programs provide a more stabilized workforce, the partnership also provides a potential cost savings to the power plants. Although there is limited educational funding, vocational education gaps, and work ethic constraints, initial external analysis based on student and workforce presence suggested interest and need for the program.
Chapter II Conclusion

Continued dialogue between business and industry and education could provide occasions for their representatives to develop a common language and bring technicians and front-line workers into the communication process. In addition, continued communication provides the opportunity for industry to “sell” the standards to those employers who do not see the need to develop the high performance worker. Bunn (1998), indicated that “educators get highly creative once they have an understanding of what is expected of them and their programs. This will enable students to make the connection between the skills being taught and relate them to work” (para. 25).

Communication can also strengthen the support for skilled trades programs between local school administrators and vocational advisory committee members.

Additional research could provide mechanisms for vocational educators to enhance employer partnerships for curriculum development, teacher training and updating of skills, and seeking equipment and tools. The literature review indicated that improved communication and stronger partnerships between business and industry and education can help establish more relevant vocational education curricula.

Community colleges face an important challenge in expanding employers’ knowledge about their programs and adjusting their programs to meet employers’ needs. They may want to develop the ability to help “create the market”—that is, not just produce the supply of degrees, but also influence the demand for those degrees. Colleges also may want to fine-tune their programs to make sure that they align with their local labor markets. Ultimately, rather than simply relying on national goals or projections of what degrees are most needed, community colleges must become more proactive in
understanding local employers’ views of the degrees and training programs they offer so they can ensure that their degrees have value.

To counteract the negative connotations or stigma associated with the skilled trades programs, community colleges may want to increase their outreach to potential employers of their graduates. While it may be difficult for colleges to reverse widespread perceptions, they can begin to develop and cultivate stronger and targeted relationships with specific employers that show an interest in hiring their graduates. In their interactions, colleges can promote the positive attributes of their students, such as their hands-on skills and specific technical abilities. More fundamental change in attitudes regarding skilled trades or more specifically energy careers would likely require greater public relations campaigns on an institutional level.
CHAPTER III

METHODOLOGY

This study investigated the perceptions held by individuals regarding the success of an Energy Production Technology degree program at one Midwest community college. The study focuses on the interaction between the college and the local Energy industry leaders who comprised the Energy advisory committee, concerning the development and progress of new Energy program development. There is a void within present literature relating to this area. Of particular interest, a significant piece of the study looked at how the students in the program perceived how well the program prepared them for the workplace, as well as the perceptions of the employers regarding their preparedness as well. This data will help the stakeholders conclude whether or not the program is hitting the mark. This chapter outlines the methods for conducting the study to answer the research questions.

Research Design

Research is a quest for knowledge. It combines inquiry and experimentation to increase the understanding of some phenomenon. “Research can be seen as a process of expanding the boundaries of our ignorance” (Goddard & Melville, 2007, p. 1). According to Morse and Field (1995), “it is the means by which discoveries are made: ideas are confirmed or refuted, events controlled or predicted, and theory developed or refined” (p. 1). During this time of discovery at Western Michigan University, when it comes to research, the coursework has mainly focused on two methodologies: qualitative and quantitative. A system of models, procedures, and techniques used to find the results of a research problem is called research methodology (Panneerselvam, 2004, p. 2). Qualitative
research involves words while quantitative research involves numbers. A combination using both of these styles is simply called “mixed methods.” The basic approach to my research study was to cultivate a better understanding about the issues through a mixed methods study.

A qualitative methodology was used because “it is a means for exploring and understanding the meaning of individuals or groups ascribe to a social or human problem” (Creswell, 2009, p. 4). “Qualitative research is used to gain insight into people's attitudes, behaviors, value systems, concerns, motivations, aspirations, culture or lifestyles” (Merriam, 2009, p. 3). One part of this research was conducted using a qualitative method. According to Denzin and Lincoln (2011) “qualitative research involves the studied use and collection of a variety of empirical materials- case study, personal experience, introspection, life story, interview, artifacts, and cultural texts and productions, along with observational, historical, interactional, and visual texts- that describe routine and problematic moments and meanings in individuals’ lives” (p. 3). A qualitative researcher discovers, explores and looks to understand phenomena while answering questions. “Those who engage in this form of inquiry support a way of looking at research that honors an inductive style, a focus on individual meaning, and the importance of rendering the complexity of a situation” (Creswell, 2009, p. 4). Qualitative analysis is used to form the description or mixed method case study and then goes onto determining the interpretation. “Conclusions in qualitative research are typically derived from identified patterns and uncovered conceptual, not statistical, relationships. The discovery of connections in the data may support a theory, revise one, or generate a new one” (Suter, 2011, p. 351).
Another aspect, the survey of graduates used a quantitative approach. Quantitative study, according to Creswell (2009), provides a numeric description of trends, attitudes, or opinions of a population by studying a sample of that population or seeks to determine if a specific treatment influences an outcome (p. 129). “In a qualitative study, inquirers state research questions, not objectives or hypotheses” (Creswell, 2009, p. 129).

“Measuring observations is the task of quantitative research” (Balnaves & Caputi, 2001, p. 33). While qualitative researchers are interested in understanding, exploring new ideas, and discovering patterns of behavior, “Quantitative researchers are concerned with the development and testing of hypotheses and the generation of models and theories that explain behavior” (Hoy, 2010, p.1).

Selection of Subjects

Purposeful sampling is a technique widely used in mixed methods research for the identification and selection of information-rich cases for the most effective use of limited resources (Patton 2002). This involves identifying and selecting individuals or groups of individuals that are especially knowledgeable about or experienced with a phenomenon of interest (Cresswell & Plano Clark, 2010). The population of my study are the individuals (students, advisory committee members, and energy employers) who are currently participating in, or who had participated in, one community college’s Energy Production Technology program. Purposeful samples are used in qualitative designs to ensure that the subjects participated in the phenomenon at the focal point of the study (Creswell, 1998).

When describing purposeful sampling, Creswell (2012) stated that, “Researchers designing qualitative studies need clear criteria in mind and need to provide rationales for
their decisions” (p. 118). There are three separate groups that were used for the purpose of this study. The purposeful sampling for this study were named Group One, Group Two, and Group Three. They are as follows:

- **Group One**: Former and current advisory committee members (2008-present) who helped establish and continue oversight of the Energy program. (N=7; interview)
- **Group Two**: Energy production employers who have hired students from the program. (N=4; interview, skills checklist)
- **Group Three**: Students that had graduated from the Energy Production Technology program during the life of the program (2008-present). (N=34; survey)

All individuals who fit into these three groups were invited to participate. To recruit subjects, contact information for all students declaring Energy Production Technology as their major from 2008-present was petitioned from the college’s records and registration office. The list provided last known email addresses and phone numbers for contacting the students. Advisory committee and employer information were gathered from the current committee contact list.

Once the subject lists are developed, all potential subjects were invited to participate via an email message. Groups One and Two were asked to reply by email if they were interested in participating. Within a week’s time, a subsequent email invitation was sent to those who have not replied, providing another opportunity to participate. Those who do not respond to either email invitation were not contacted further.

Individuals who did not respond to the email request were considered either to have declined to participate or to be unreachable using the available contact information. The
study was delimited to those students, employers, and advisory committee members who could be contacted and agreed to participate. To protect the rights of the informants, approval from the Human Subjects Institutional Review Board (HSIRB) was attained from Western Michigan University and the college involved in the study and informed consent forms were provided and signed.

An informed consent document was sent out to the advisory committee members and employers (Groups One & Two) being interviewed to explain the purpose of this research project. Those individuals (Group Three) being surveyed online were asked to review the consent information on the first page of the survey prior to engaging in the survey. The consent defined the time commitments, the procedures used in the study, and the risks and benefits of participating in this research project. The participants were asked to read the consent form carefully and completely and to please ask any questions if they need more clarification.

**Group One**

Personal interviews were conducted with seven individuals who had or still continue to participate in the advisory committee. The interviews were used to capture the perceptions of these individuals. To address research question number one, advisory committee participants were asked their perceptions regarding their role with the program including questions about curriculum, equipment, facilities and job placement.

**Group Two**

Personal interviews were conducted with four individuals who have employed students from the college’s Energy program. Their opinions were restricted to the examination of students from those years (2008-2015) who had graduated from the
program and have then worked in the energy industry. To address research question number two, these participants were asked their perceptions about how the college program prepared students for employment in the Energy field. Included as part of the interview process, these individuals were also asked to complete a skills checklist survey to address specific skillsets graduates they’ve hired attained from the program. As with the students, it is equally important to conclude what this new program experience meant to the employers, and to determine what they believed to be the strengths and weaknesses of the program, based on their perceptions of students’ preparedness for working in the industry.

**Group Three**

Based on graduation data received from college records, there were presently 125 potential program graduates to be surveyed. The initial email request was sent out on 6/25/15 and 10 addresses immediately bounced back as undeliverable. Subsequent follow up emails were sent on 6/30/2015 and 7/20/2015 to provide graduates with a reminder to complete the survey by 7/31/15 to complete. All told, 34 students (n=34) completed the survey out of 115 that received the emails which represents a 30% response rate.

Online surveys were used to capture the perceptions of the students who graduated from the program. To address research question number three, program participants were asked their perceptions about how the college program readied them for employment in the Energy field and to provide a reflection of their scholastic experience at the college. “For research participants to explore their experience, they must be able to relive it in their minds” (Burke & Christensen, 2004, p. 367). Because this was a new
program to the college, all individuals who had listed Energy Production Technology as a major and graduated were invited to provide input. It is important to conclude what this new program experience meant to the participants, and to determine what they believed to be the strengths and weaknesses of the program, based on their perceptions of their experience and preparedness for working in the industry. All feedback solicited was important to review and evaluate.

**Data Collection Methods, Procedures and Instrumentation**

The primary data gathering tool of this study for Groups One and Two was in-depth interviews (Appendix A & B), and for Group Three was an online (Appendix C). Regarding the online-survey, a six-point Likert scale was used to determine the degree to which graduates perceived they were equipped in areas of the specific curriculum and the level of significance regarding that material to their employment. Students were emailed online surveys given the ease of online access to the students involved. Over the course of the time spent at the college, the students have been conditioned to email as a method of interaction and response.

For the purpose of this research, standardized open-ended interview were used for Groups One and Two. The interviews were open-ended, conversational, and exploratory. According to Creswell (2007), “As common with quantitative analyses, there are various forms of interview design that can be developed to obtain thick, rich data utilizing a qualitative investigational perspective (p. 13). The interviews provided the opportunity for each participant to describe his or her perceptions of their experiences within the Energy Production program. Interviews with selected advisory committee members and employers were conducted either in-person or by phone and were recorded, transcribed,
and coded, after which all the associated processes of data collection and analysis were reviewed. In the standardized open-ended interview, participants were asked identical questions, but the questions are worded so that responses were open-ended (Gall, Gall, & Borg, 2003). According to Turner (2010), “this open-endedness allows the participants to contribute as much detailed information as they desire and it also allows the researcher to ask probing questions as a means of follow-up” (p. 755). The questions were designed to explore a more profound level of understanding through analysis. “Most mindful qualitative research questions are “How” or “What” questions (e.g., “How did this happen?” “What is going on here?”) and geared toward complex processes, exploration, and discovery” (Suter, 2011, p. 346). Given the nature of open-ended questions, open-ended interviews allowed the participants to more fully express their perspectives.

Included as part of the interview process for the employers, these individuals were also asked to complete a skills checklist survey to address specific skillsets graduates they have hired attained from the program. A six-point Likert scale was used to determine the degree to which they perceived graduates they have hired were equipped in areas of the specific curriculum and the level of significance regarding that material to their employment.

In this study, subjects were asked to secure a location where they could spend up to an hour of uninterrupted time where the participants can provide their undivided attention. All conversations were recorded with the participant’s encouraged to speak freely. Follow-up questions were asked as needed to explore a concept further, or if necessary to guide the conversation back to the central subject. Robust central themes guided the data analysis process.
Once all data was sorted and analyzed, patterns began to materialize. A theme such as “nuclear culture” for example, was developed to facilitate additional layers of complex analysis. The interpretation of data also required a basic understanding of human behavior as it was important to interpret each individual’s explanation. It was equally important to provide a comprehensive review throughout the process of analysis and data collection.

Confidentiality of Subjects

Since the research sought non-threatening personal perceptions and observations about academic experience and workforce preparation, there was little threat that may have been perceived when engaged in open and honest dialogue. The study was not of a nature that it could have been considered embarrassing or threatening to the subjects in any way that might have prevented them from responding in frank or even blunt statements.

A list of code numbers and pseudonyms for each subject was developed and maintained. The list will be kept in a locked file where only the researcher has a copy of the key and could know the true identity of each subject. Any recordings have been identified with the code number to protect the identity of the subject. All audio tapes and written records are being kept under lock and key by the researcher and maintained according to requirements of HSIRB. Once the research is completed, all written, electronic and recorded records will be destroyed.

Known risks to the subjects were limited to the inconvenience of their time and the potential for their responses to be made public through the dissertation dissemination process. Since all dissertations are published and made available to other researchers,
some of their responses may be quoted in the dissertation and subsequently published, however, their names and other identifying factors will have been kept strictly confidential. If a name was needed in the dissertation to improve readability, a pseudonym was used. Other identifying information was also masked. For example, a participant may have been identified as "Ralph or Alice" in lieu of using their real name."

Interviews did not take place until the participant signed this written consent. All subjects were offered the opportunity to stop participating in the study at any time for any reason. They did not suffer any prejudice or penalty by their decision to stop participating. They experienced no consequences if they choose to withdraw from the study.

**Data Analysis Processes and Procedures**

A data analysis process, see Table 1, was necessary in order to cultivate themes from the surveys and interviews conducted during this case study in order to compile the narrative. To organize the survey data, the researcher used Survey Monkey as a data collection tool. Since Survey Monkey does not provide advanced statistical data analysis, the researcher exported the data into a spreadsheet to evaluate the data. Surveys for Group Three used a six-point Likert scale including an open ended question asking their perception of the program. Likert-type or frequency scales use fixed choice response formats and are designed to measure attitudes or opinions (Bowling, 1997; Burns & Grove, 1997). For tabulating purposes each answer to the survey questions were coded on a score of 1-6 (Strongly Disagree (1) and Strongly Agree (6)).
Table 1

*Crosswalk of Research Questions, Data Source and Analysis*

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Data Source</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. From the viewpoint of the business and industry advisory committee created to</td>
<td>Open Ended</td>
<td>Develop Themes</td>
</tr>
<tr>
<td>oversee an Energy Production Technology degree program:</td>
<td>Interviews</td>
<td>and Provide</td>
</tr>
<tr>
<td>a. How effective is the feedback loop between the student, employer, and advisory</td>
<td></td>
<td>Analysis</td>
</tr>
<tr>
<td>committee in order to for the program to successfully maintain program outcomes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>as required by Nuclear Uniform Curriculum Program (NUCP);</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. How successful was the program for establishing a pipeline for a new workforce;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. What key lessons were learned?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. From the viewpoint of the power plant employer, to what extent do they perceive</td>
<td>Open Ended</td>
<td>Develop Themes</td>
</tr>
<tr>
<td>that Energy Production Technology program graduates were adequately prepared for</td>
<td>Interviews, Skills</td>
<td>and Provide</td>
</tr>
<tr>
<td>employment?</td>
<td>Checklist Survey</td>
<td>Analysis</td>
</tr>
<tr>
<td>3. From the viewpoint of the program’s graduates, to what extent do they perceive</td>
<td>Online Survey</td>
<td>Descriptive</td>
</tr>
<tr>
<td>they were adequately prepared for employment, and what program attributes most</td>
<td></td>
<td>Statistics of</td>
</tr>
<tr>
<td>supported their efforts?</td>
<td></td>
<td>Survey Results</td>
</tr>
</tbody>
</table>

According to Marshall and Rossman (2006), typical analytic procedures fall into these seven phases: "(a) organizing the data; (b) immersion in the data; (c) generating categories and themes; (d) coding the data; (e) offering interpretations through analytic memos; (f) searching for alternative understandings; (g) and writing the report or other format for presenting the study" (p. 156). Marshall and Rossman’s process was followed in order substantiate the evidence collected in this research. To organize the interview data, the researcher made audio recordings of each personal or telephone interview and transcribed them into a word document format. All individual transcripts were copied and
organized into a spreadsheet where they can be compiled and coded. Coding of the data was accomplished through a process known as "phenomenological reduction" (Creswell, 1998). The data was organized into segments as different themes emerge.

Validation of Data

Additional analysis was completed in order to have the interview evidence validated. “In qualitative research, validation has focused on assessing how well participants’ meanings have been captured and interpreted” (Ritchie & Lewis, 2013, p. 358). There are two key ways of having the data analyses validation done. The first method, which was used by this study, is by respondent validation (or member check) which is returning to Groups One and Two study participants and asking them to validate analyses (Burnard, Gill, Stewart, Treasure, & Chadwick, 2008, para. 19). The interview subjects were provided transcripts of the interview and asked to review the account as deduced by the researcher, to make sure their narrative was accurately applied. A second method, peer review (or peer debrief, also referred to as inter-rater reliability) is whereby another qualitative researcher analyses the data independently. This method was not chosen due to the researcher’s key involvement with the program and the potential additional cost of hiring additional staff.

The Researcher

The purpose of a qualitative research design is to more deeply understand a given situation or case. The observer or researcher in this case, constructs from the subjects’ experiences a unique subjective perspective. Through the evidence attained, the researcher is the analysis across all phases of the research project (Starks & Trinidad, 2007). Because of the depth of the researcher’s involvement in the overall project, it is
inherit that preconceptions by the researcher may influence the data. According to Tufford and Newman (2010), “Bracketing is a method used in qualitative research to mitigate the potentially deleterious effects of preconceptions that may taint the research process” (p. 80). This process allows the researcher to “mitigate the potential deleterious effects of unacknowledged preconceptions related to the research and thereby to increase the rigor of the project” (Tufford & Newman, 2010, p. 81). The researcher subsequently recognizes and then puts aside all biases and personal experiences.

“Interpretive research begins and ends with the biography and self of the researcher” (Denzin, 1989, p. 12). Prior to 2008, the researcher spent no time working in or around the energy field. Prior to that, the researcher spent 10 years working in the manufacturing training area of the college. Previous education experiences included involvement in the apprentice department as an adjunct faculty at the college and completion of a BAS at a local University. After a couple of years as an apprentice instructor, and then hired as full time machine tool instructor, a master’s degree in CTE helped pave the way to a department chair role in the Technologies Department. Having spent a couple of years as the chair of the Technologies department, while also now chairing the colleges curriculum committee, the researcher has been involved in nearly every aspect of the college’s technology programs. Based on the career spectrum of the researcher, as an alumnus of a technology program at the college, and then as a chair and now Dean of the Career Education programs, the researcher has profound interest in the outcomes of the study. This is important in regards to subject access according to Marshall and Rossman (2015), “The energy that comes from the researcher’s high level of personal interest (called bias in traditional research) is
infectious and quite useful for gaining access” (p. 320). However, this personal interest or bias is seen as a threat to validity. This biography condenses and establishes the researcher's "brackets" relative to this study.

**Chapter III Conclusion**

This study investigated the perceptions held by participants associated with a newly created Energy Production Technology program at one community college. A mixed methods study was selected as the model for exploring the insights of the individuals involved. Upon reviewing the survey data and the interview transcripts collected, participants in the program should have a better understanding regarding the impact the program has had locally. The data was collected, analyzed, and processed with the detail findings reported out in Chapter IV.
CHAPTER IV

RESULTS

The purpose of this research was to determine the perceived success of an Energy Production Technology (EPT) degree program within one Midwest community college created in partnership with its local business and industry service district (energy production industry). It was essential to examine the feedback process within this partnership to determine if the program was yielding effective results as perceived by program graduates and their employers. Equally important was to assess the satisfaction of the role played by the members of the advisory committee that was developed to implement and provide oversight to the program.

This chapter provides the results of the research findings along with an analysis of the data resulting from the open-ended interviews of four employers who have employed students, and seven advisory committee members who had helped to develop and provide oversight to the program. Also reported out is survey data from 34 students who have graduated from EPT program over the last several years (2008-2015). Data were collected during the months of June and early August 2015. Questions asked during recorded telephone interviews were open-ended and designed to elicit in-depth responses.

Three research questions formed the basis for this study. The intent was to: (1) determine the perceptions of the advisory committee participants regarding their role with the program including questions about curriculum, equipment, facilities and job placement; (2) understand the perceptions of employers regarding how the college program prepared students for employment in the Energy field; and (3) ascertain program
participants perceptions about how the college program readied them for employment in the Energy field and to provide a reflection of their scholastic experience at the college.

**Research Question One**

An open-ended interview protocol was used to gather in-depth information from the advisory committee members regarding their perceptions of key issues that lead to the development of the EPT program. Using thematic analysis (Creswell, 2003), interviewee statements from the advisory committee were evaluated based upon the replies to the individual research questions, and where necessary, categories and themes were formed. Recurring points, statements and significant philosophies were coded according to those themes, and are discussed in depth in the following sections. In order to provide anonymity, aliases are used whenever a subject's name appears.

**Data Reduction and Bracketing**

Chapter III provided a basic explanation of the data analysis processes and procedures in regards to data reduction and bracketing. While reviewing the transcripts, common statements or expressions that appeared to be connected to the research questions were highlighted as significant. These significant topics were coded with a label. Through the data analysis process, significant topics were grouped into themes using the reduction process. For example, statements that were coded as "developing a local hiring pool" were grouped with other significant topics coded as "lack of trained individuals," “entry-level candidates,” and “looking for employable people” into a larger theme coded as “creating a worker pipeline.” Each significant point from the transcripts of the employers and advisory committee were coded using the similar framework from
the example listed above. Through the raw data collected from the employers three themes emerged, while the advisory committee interviews fostered four themes.

To address research question number one, former and current advisory committee participants, group one, were interviewed and asked their perceptions regarding their role with the program including questions about curriculum, equipment, facilities and job placement. Eight individuals were contacted with seven agreeing to participate in the study. The individual who denied, although a member of the original program founding committee, felt as though he had been away from the program too long as he stepped away in 2010. Following is the list of the seven respondents, along with their corresponding alias, representing the three different power plants in the area: Plant A, Plant B and Plant C. Mark and Garrett were from Plant A, Larry was from Plant B, William was from Plant C and Alice, Randall, and Aaron were the individuals from the college representing the advisory committee. The respondents for research question 1 from each power plant are different individuals than from the employers speaking to research question 2. The individuals on the advisory committee are representatives from the plants that had a desire to be a part of the EPT development and oversight process.

During the interview process, study participants were asked to reflect on their experiences as an advisory committee member, why they felt it was important to participate in the program, describe the NUCP feedback loop, describe the impact to the worker pipeline, provide lessons learned and reflect on significant experiences (see Appendix A). Analysis of the interview data provided dominant themes that participants viewed as significant factors regarding their participation in the program’s advisory committee. Coded statements were grouped and four common themes emerged. In
general: (1) program has created a worker pipeline; (2) be sure to involve the right
stakeholders; (3) program not adequately preparing graduates to pass the pre-employment
test; and (4) need a better understanding of balance between labor supply and demand.
These themes are discussed in depth in the following sections.

Theme One: Program has Created a Worker Pipeline

The main objective of this Energy Production Technology program is to help fill
the staffing needs of the local energy beginning to happen due to retirements and a
deemed lack of a skilled workforce in the region. This is supported by data reported in
Chapters I and II that states how nearly 40% of the nuclear industry work force will be
eligible to retire within the next five years, coupled with how military cuts are drying up
the candidate pool. Each member of the advisory committee interviewed presently
working in a nuclear plant made reference to the same notion.

William stated that,

Some of the traditional pipelines, like the nuclear Navy still exist but it’s
becoming harder and harder to find the individuals that either have the
background knowledge and skill or the desire to work in the power generation
industry for a variety of reasons and it seemed like a partnership with the college
could provide us with another flow path into that pipeline.

Larry echoed that comment but also stated a different concern that many others posed
regarding hiring Navy or out of area recruits into the plant. He stated,

One of the big issues that we were having is the guys would come there from out-
of-state or whatever because they were getting out of the Navy and they needed a
job and as soon as they got their licenses or as soon as they were qualified or a
fully qualified non-licensed operator that made them hire-able to their local utility, or as soon as their local utility had a job available, they left.

Larry also felt that, “That's not very productive for an employer to be ‘quote-unquote’ training individuals just so they can go work somewhere else.” Based on concerns that stemmed from this group, the program needed to focus on local talent. Alice, a representative from the college, had similar remarks about the need for prepared employees:

Well, at the time I came on board the industry was asking for trained people to be prepared to come in and work. At that time it looked as if there were going to be a lot of retirements and the energy, the development of nuclear power was going to be on an uphill swing and it looked as that it was important to get people ready to go into that.

Based on the perspective of developing local talent coupled with the perceptions of mass retirements, the advisory committee commented favorably that the college did indeed put in place an adequate pipeline with at least 45 of the 125 program graduates presently employed in the energy industry. According to Stanley, another college representative stated, “I think it’s been huge. I mean look at the number of graduates who are working at the local plants…before this program, we had nothing.”

It is important to note that the pipeline or employment numbers mentioned are gathered as part of the NUCP process that gathers employment data for each region. The data is collected through a phone call campaign that is done annually to determine whether or not the graduates are working in the industry. Based on this, it should be pointed out that the number of EPT graduates employed in the energy industry could
potentially be higher as only 105 of the 125 graduates have been reached for comment. The employment data ascertained in the phone call campaign mentioned was not part of the data gathered for this study.

Theme Two: Be Sure to Involve the Right Stakeholders

The key functions of an advisory committee are to identify workforce needs, recommend skills sets, review (validate) curriculum, collaborate with stakeholders and constituents to promote public relations, raise funds, recruit personnel, and evaluate the program. Collaborating with key stakeholders came to light quite often during the interview process with the advisory group. These stakeholders are representatives from applicable businesses and industries that reflect the focus occupation. “Get your employers on board so that they understand what you’re doing,” stated Mark. Alice commented that, “The NUCP programs that have been successful have really tight relationships between employers and schools.” Mark’s main advice for other schools looking to develop a program was:

I would say advice wise, is make sure you’ve got the right stakeholders involved. You can get the program up and going but make sure you’ve got the stakeholders involved in that the utility is going to come through with what their needs are.

A main focus was getting the right people involved with the program so key decisions can be made that will help the program. Another point by Mark is to have, “The right people on the committee knowing, whether they are HR or whoever may be, that can speak to the numbers that we are going to need or this the training that these students are going to have.”
It was also mentioned how well the college did to get as many stakeholders involved who engaged in the program development process, whether it be other energy industries such as wind or solar, or other entities such as high schools and technical centers. So much so, three responders’ key takeaway from the committee experience even alluded to this. Larry stated, "Overall, very simply, the willingness of the college to engage as many people on the advisor advisory committee as it could and to expand it,” while Mark stated, ”My experience, definitely from the college perspective, you guys had people engaged the entire time and I appreciated that.” William concluded that,

I would start with the professionalism and willingness to really fulfill the function or the need on the college’s part. I think that it was pretty clear that the college understands that their mission in life is to train the workforce for the surrounding community.

Community colleges continue to face important challenges in expanding stakeholder’s knowledge about their programs and adjusting their programs to meet local employers’ needs. Colleges must fine-tune their programs to make sure that they align with their local labor market.

Despite getting key right stakeholders on board, not having the right person from all levels within the industry did impact the effectiveness of the feedback loop for the NUCP process between the committee, employer, and student. Mark went on to say, “Feedback wise, to be honest, I really wish we would add more stake from a management level… it seemed like there was a lot of in between that lacked getting information from a real stakeholder.” Alice labeled the feedback loop as “disappointing.” She went on to elaborate,
That was a disappointment. That was not as robust as I had expected it to be. It was not very effective and I think it ended with the plant having some disappointments with the students that we really weren’t able to correct, didn’t know to correct.

In other words, based on this feedback, because of the lack of stakeholder involvement regarding student results, some outcomes were not addressed and it sometimes hurt the reputation of the program. For example, respondents commented on situations where the plants hired individuals in a job area outside of the concentration that the students were trained in. When the student faltered, the supervisor of the student singled out the college as not training the student properly. Because this supervisor was not connected to the advisory committee, they were not always involved in the feedback loop nor did they know to connect to at the college for follow up. However, the feedback loop was not always a bust according to Alice who stated, ”I think when the plants gave us feedback, I think we were pretty responsive …we really got to the bottom of an issue”. There was, on more than one occasion, when the plant talked to the college about a shortcoming with training at the college and changes were then made to the curriculum. However, overall, the respondents were disappointed with the lack of feedback received from stakeholders regarding program outcomes.

**Theme Three: Program Not Adequately Preparing Graduates to Pass the Pre-Employment Test**

The nuclear energy industry utilizes pre-employment testing on certain jobs to identify and assess a candidate's abilities and skills when these are required. When the program was first developed, the concept of pre-employment testing was not an issue strongly discussed by the advisory committee. It was an afterthought. Also, students were
vaguely aware of the process, and the curriculum was not developed so that it transitioned easily into successful pre-employment exam scores; Students were not prepared for such tests. This was a hot button topic amongst all three groups (students, employers, advisory committee). Larry felt quite strongly regarding this as he stated that, "The biggest gap that I saw for the entire time I was there and I would be surprised if it's not still gap today, was the mathematics to prepare the students for MASS/POSS test.” Indeed, the mathematics portion of the Power Plant Maintenance Selection System (MASS) test is what students most typically fail (personal knowledge). The MASS exam is a group of four short aptitude tests designed and validated to aid in the selection of candidates for electric utility industry operations and maintenance occupations. Some of the job titles covered by the validation study include Mechanic, Machinist, Electrician, Welder, Pipefitter, Steelworker, Rigger, Instrument and Control Repairer, Helper, Painter, and Insulation worker. This test assesses mathematics, reading comprehension, mechanical comprehension, and assembly abilities. Unfortunately for students, if they fail one aspect of the test, they fail the whole test and, therefore they cannot be hired to work at the nuclear plant in those job capacities until they have passed the test.

Garrett discussed his frustration with the students’ preparedness for the exams when he stated,

For some reason we’re not yet getting this employment testing thing down. We’re not getting students prepared for it. We just got nailed. You know, we had some really good students who were contracted for a couple of outages, who made an impact and the plant was ready to pick him up. Again, they take the employment tests and it all falls to pieces on them. That is an extremely frustrating thing.
William phrased it as “demoralizing” for a student to go through the program and not be able to get a job in the industry because of the entrance examination.

**Theme Four: Need a Better Understanding of Balance Between Labor Supply and Demand**

During the development process the college faced significant challenges to help “create a market”—that is, not just harvest a supply of degrees, but also influence the demand for those degrees. In June 2008, the two local power plants the college announced the offering of a new Energy Production Technology degree program. To gage local interest, the College and energy industry experts hosted three free information sessions about the program for prospective students. For these sessions combined, almost 300 local residents attended the events and ultimately the Fall 2008 semester began with almost 100 students enrolled in the Energy Production Technology program. In one year’s time over 230 students took classes in the Energy Production program.

By the spring of 2011 over 87 students graduated from the program, but over the course of the next few months only 33 of those graduates obtained positions in the industry. The data gathered from students in this study will speak to their disappointment regarding those numbers. Unfortunately, as disappointed as they were, responders alluded to the economy as a driving factor behind the lack of hiring. Mark’s perspective regarding how the economy affected the pipeline, was this:

>The numbers really…. it was a bummer because we got into the… the whole industry got on board with this and we were going to have all these people retire. We really haven’t seen the retirements that we thought we had because the economy went south and people lost their 401k’s. People stayed on and the company didn’t hire.
William also discussed how the business or lack thereof affected the ability to hire EPT graduates:

I think that the utilities and the generating plants that partnered with the college, for a variety of reasons, probably mostly business related, didn't really hold up their end of the bargain. The pipeline, to go out and to place the students, probably wasn't as large as what the college was led to believe.

Garrett stated that the question that was never asked was, “How many people can we expect to have possibly get hired? Plant B, how many do you need? Plant A, how many do you need?” The college and the plants alike were mainly excited that they built a program and somebody came. Larry commented that, “We tried to be careful, we tried to tell people this is a career path. This doesn't mean that you're going to get a job when you get out.”

Founded on the lack of a more in-depth environmental scan and needs analysis, what came to light is that it was probably irresponsible to let the program balloon to 230 students. Although hindsight is twenty-twenty, Larry suggested that:

My biggest advice is to watch your numbers. We kind of were told that by few people up front. In retrospect we probably should pay more attention to that. Watch the numbers based on the demand in the local community and basically put a cap on the number of people that are in the program.

Based on the disappointment from those that could not find employment in the industry, making sure to have the right balance of labor supply and demand is critical.

To summarize the responses to research question number 1, from the viewpoint of the seven advisory committee members interviewed, the program was successful for
creating a worker pipeline; unfortunately there were not enough jobs to go around for all of the graduates. The group was also conflicted regarding the success of the feedback loop between the student, employer, and advisory committee in order for the program to successfully maintain program outcomes as required by the Nuclear Uniform Curriculum Program. Several committee members commented that the feedback loop worked when it happened, but it did not always occur because the plants did not provide feedback based on how graduates were working out in the plants.

Key lessons learned included making sure the college has the right stakeholders at the table, making sure that the students are better prepared for the nuclear culture which includes the entrance exams, while also understanding the market necessary for a right sized student population.

**Research Question Two**

The second research question sought perceptions from individuals was have employed students, group two, from the college’s Energy program. An open-ended interview protocol was used to gather in-depth information from the employers regarding their perceptions about how the college program prepared students for employment in the Energy field. Using the same thematic analysis as used in research question one, interviewee statements from the employers were evaluated based upon the replies to the individual interview questions, and where necessary, categories and themes were formed. Recurring points, statements and significant philosophies were coded according to those themes, and are discussed in depth in the following sections. In order to provide anonymity, aliases are used whenever a subject’s name appears. Employers were also asked to complete a skills checklist as well.
Out of the nine individuals contacted, there were four respondents interviewed representing two different power plants in the area, Plant A and Plant B. The feedback received regarding the low percentage of participation from the employers was due to busy schedules. The respondents interviewed for research question 2 from each power plant are different individuals from those who are on the advisory committee and were interviewed on issues related to research question 1. These individuals are employees at the plants that have direct working knowledge of EPT program graduates. James, Ralph, and Evan were from Plant A, and Jeremy was from Plant B. The Plant A nuclear plant has hired quite a few more students than any other power plant, so their input was highly sought after. To address research question number two, these participants were asked their perceptions about how the college program prepared students for employment in the Energy field. As with the students, it is equally important to conclude what the new programs experience meant to the employers, and to determine what they believed to be the strengths and weaknesses of the program, based on their perceptions of their evaluations of students’ preparedness for working in the industry (see Table 1).

During the interview process, study participants were asked to reflect on whether the EPT program prepared students for a career in the energy industry, how they compared to other school’s graduates, what skills they were best or least equipped with, and what additional advice they could provide to the college to help strengthen the program. Analysis of the interview data provided dominant themes that participants viewed as significant factors regarding the college’s program preparing students for employment in the Energy field. Coded statements were grouped and three common themes emerged. In general: (1) students are well prepared on core technical skills; (2) individuals from the
military are better prepared; and (3) the program needs to better prepare students for the “nuclear culture.” These themes are discussed in depth in the following sections.

Additionally, employers also filled out a skills checklist (see Appendix B) that included questions regarding: skills preparedness, core fundamentals preparedness, and overall preparedness.

**Theme One: Students are Well Prepared on Core Technical Skills**

Based on both the interview responses and the replies to the skills checklist (see Tables 1-3), employers from each plant agree that EPT graduates have the core technical skills necessary to work in the energy industry. Evan from Plant A stated, “They’re good at what they do. They came into the training class here from the courses and I think that gave them a good leg-up for the next level. The plant specific, system specific things.” Jeremy from Plant B supported this by saying that, I think the program was successful in accomplishing giving people the basic skills they needed to be able to compete with other individuals that might have actual industrial type experience whether it be at other power plants or the Navy.

Evan and James also talked about the energy graduates’ strong technical skills and also having the capacity to get things done: “when we assign them things and provide little oversight, they do a great job” and “they had a good handle on most of the technical concepts that we deal with here.”

Some of the key technical concepts graduates had, that the responders alluded to in the interview were computer skills, basic systems and basic components knowledge which was also prevalent in the skills checklist (see Tables 1-3) the employers completed. Other key skills that were corroborated between the interviews and the checklist included the
ability to successfully demonstrate safe work habits, work in teams, work independently, and communicate clearly and effectively. Specifically regarding computer skills James commented that, “I also found that a lot of them and maybe just because they’re younger, they have good computer skills.” He stated that one student in particular “helps a lot of guys out with working on the computers. Us old-timers a lot of times, we don’t keep up with some of the newer computer technology and when things evolve.”

**Theme Two: Individuals from the Military are Better Prepared**

When asked, how Energy Production Technology graduates from the college compare to those graduates from other technical programs (military, other colleges), all respondents collectively stated that the military has an advantage. Evan stated that, 

As far as military, they’re probably a little, a step below that. Only because the military is so ingrained in the people both in theory and technology but also the discipline and teamwork. It just becomes a part of life every day when you're in the military.

Jeremy supported that by stating,

They're behind with the military and the reason though isn’t because of the schooling, it’s because of the fact that once they’re in the military they just don’t go to school then try to get a job. They actually then get anywhere from 6 to 8 years’ worth of experience that goes with that.

A key theme that should be pointed from both of these individual’s statements is it “isn’t because of the schooling,” it is ingrained in the military recruits because it is their job.

Evan sees the military as having an advantage as well because of their prior job experiences. He states, ”they’re more prepared for what the job entails, what they’re going
to see day to day, working in the plant, some of the processes, some of the protocols that we have, the procedures, the soft skills.” Evan also supports the colleges’ students’ preparedness comparing the military vets by stating that,” the EPT folks come over, and they’ve got some of the academics stuff down but I don't know that they always fully understand what they're going to be doing once again hired in.” Although each employer supported the military at the onset, each made a similar statement that,” the EPT candidates that we have, they are able to bring themselves up to the same level of performance. It’s just that they’re starting out behind the gate a little bit.”

**Theme Three: The Program Needs to Better Prepare Students for the “Nuclear Culture.”**

In Table 1 of the skills checklist response, employers of EPT graduates moderately agreed that graduates were prepared. However, what the skills checklist did not pick up on that the interviews did was the concept of preparedness to be an employee in the nuclear field. When asked about some shortcomings of EPT graduates, Evan stated:

Probably just the difference in our industry and how we do business. There’s lot of soft skills, and human performance type items, three-way communication, procedure use and adherence. We have very strict guidelines on how to work through the procedure. We have like self-checking techniques when you get ready to operate something. How to go through that type of protocol to operate equipment so while they were equipped with the technical side of it some of the softer skills, they had to learn. It’s different. If you’ve worked anywhere else… what people say here in the nuclear industry was, the one place I ever got in trouble because I was working.
Ralph mentioned that the nuclear industry is “special” because of the constant oversight and paperwork employees are thrust into. He mentioned that this is another part of the nuclear culture that students may not know or learn in a college environment. As mentioned in Chapter I, the unique features of nuclear energy and its procedures present distinctive requirements for the education and training of its workforce.

An additional aspect of the nuclear industry where graduates were considered less than prepared were the pre-employment exams that are required for technical staff, and the interview skills of the graduates. It should be pointed out that throughout the employer interviews, advisory committee interviews and student survey comments, both of these topics were a hot button for these groups. As far as the interview skills, Jeremy, who also taught adjunct for the college stated,

I know a lot of individuals that I personally had in class and things of that nature, that I knew had the knowledge and the skills and the ability to move forward didn’t really have the ability to present themselves in such a manner for that someone that is just meeting them cold would understand that and be able to comprehend that.

Employers were also asked to fill out a skills checklist based on the programmatic review guidelines regarding the student’s preparedness. Tables 2-4 show the respondents’ answers to those questions regarding graduates’ skills preparedness, core fundamentals preparedness, and overall preparedness. The total mean scores in Table 2 ranged from 4.50 – 5.50. Overall the employers moderately agreed that the graduates had the necessary core skills. It should be noted that the lower standard deviation (SD) would generally mean that there was solid alignment amongst the respondents’ responses;
however, having the small number of individuals interviewed (n=4) drastically affects the confidence interval of this data.

Table 2

Employers’ Perceptions of Graduate Skills Preparedness

<table>
<thead>
<tr>
<th>Question</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall, program prepared graduates hired for these job skills:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. successfully demonstrate safe work habits.</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>4(100.0)</td>
<td>0(0.0)</td>
<td>5.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>B. successfully work in teams.</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(50.0)</td>
<td>2(50.0)</td>
<td>5.50</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>C. successfully work independently.</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(50.0)</td>
<td>1(25.0)</td>
<td>5.00</td>
<td>0.71</td>
<td></td>
</tr>
<tr>
<td>D. successfully solve complex problems</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(50.0)</td>
<td>2(50.0)</td>
<td>4.50</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>E. document clearly and effectively.</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(50.0)</td>
<td>0(0.0)</td>
<td>4.50</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>F. communicate clearly and effectively.</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>1(25.0)</td>
<td>2(50.0)</td>
<td>5.00</td>
<td>0.71</td>
<td></td>
</tr>
</tbody>
</table>

Note: Likert Scale = Disagree Strongly (1), Disagree Moderately (2), Disagree Slightly (3), Agree Slightly (4), Agree Moderately (5), Agree Strongly (6).

The mean scores for Nuclear Uniform Curriculum Program (NUCP) core fundamentals preparedness (see Table 3) were above the mid-point with a range of 4.00 – 5.25. The highest skill score was “Computers (plant specific),” and the lowest was a tie between three topics; "Electrical Sciences,” “Heat Transfer and Fluid Flow” and “Chemistry.” All four supervisors scored these topics equally.

Table 3

Employers’ Perceptions of Nuclear Uniform Curriculum Program (NUCP) Core Fundamentals Preparedness

<table>
<thead>
<tr>
<th>Question</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall, program successfully prepared graduates with these NUCP core fundamentals:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Mathematics.</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>1(25.0)</td>
<td>3(75.0)</td>
<td>0(0.0)</td>
<td>4.75</td>
<td>0.43</td>
</tr>
<tr>
<td>B. Physics.</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>3(75.0)</td>
<td>1(25.0)</td>
<td>0(0.0)</td>
<td>4.25</td>
<td>0.43</td>
</tr>
<tr>
<td>C. Electrical Sciences.</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>4(100.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>4.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
Table 3—Continued

<table>
<thead>
<tr>
<th>Question</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. Basic Atomic and Nuclear Physics.</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(50.0)</td>
<td>2(50.0)</td>
<td>0(0.0)</td>
<td>4.50</td>
<td>0.50</td>
</tr>
<tr>
<td>E. Heat Transfer and Fluid Flow.</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>4(100.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>4.00</td>
<td>0.00</td>
</tr>
<tr>
<td>F. Chemistry.</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>4(100.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>4.00</td>
<td>0.00</td>
</tr>
<tr>
<td>G. Properties of Reactor Plant Materials.</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>3(75.0)</td>
<td>1(25.0)</td>
<td>0(0.0)</td>
<td>4.25</td>
<td>0.43</td>
</tr>
<tr>
<td>H. Radiation Detection and Protection.</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>1(25.0)</td>
<td>3(75.0)</td>
<td>0(0.0)</td>
<td>4.75</td>
<td>0.43</td>
</tr>
<tr>
<td>I. Reactor Plant Protection and Safety.</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(50.0)</td>
<td>2(50.0)</td>
<td>0(0.0)</td>
<td>4.50</td>
<td>0.50</td>
</tr>
<tr>
<td>J. Computers (plant specific).</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>3(75.0)</td>
<td>1(25.0)</td>
<td>5.25</td>
<td>0.43</td>
</tr>
<tr>
<td>K. Basic Systems Knowledge.</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(50.0)</td>
<td>2(50.0)</td>
<td>0(0.0)</td>
<td>4.50</td>
<td>0.50</td>
</tr>
<tr>
<td>L. Basic Components Knowledge.</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(50.0)</td>
<td>2(50.0)</td>
<td>0(0.0)</td>
<td>4.50</td>
<td>0.50</td>
</tr>
</tbody>
</table>

Note. Likert Scale = Disagree Strongly (1), Disagree Moderately (2), Disagree Slightly (3), Agree Slightly (4), Agree Moderately (5), Agree Strongly (6).

On the skills checklist, question 3 asked about overall preparedness. The total mean score to this topic was 5.25. Overall the employers moderately agree that the program provided overall preparedness.

Table 4

Employers’ Perceptions of Students’ Overall Preparedness

<table>
<thead>
<tr>
<th>Question</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall the Energy Production Technology Program has: successfully prepared the graduates I have hired for a career in the energy industry.</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>3(75.0)</td>
<td>1(25.0)</td>
<td>5.25</td>
<td>0.43</td>
</tr>
</tbody>
</table>

Note. Likert Scale = Disagree Strongly (1), Disagree Moderately (2), Disagree Slightly (3), Agree Slightly (4), Agree Moderately (5), Agree Strongly (6).

To summarize the responses to research question number 2, overall the four employer respondents believed that Energy Production Technology program graduates were prepared for employment. Areas where they felt that the graduates could use some work would mostly be preparing for the nuclear culture, an area where they felt military
recruits were ahead. The employers felt that the graduates were strong academically only
needing work on areas such as: Electrical Sciences, Heat Transfer and Fluid Flow and
Chemistry, but in general were an asset to the plant.

**Research Question Three**

The third research question sought perceptions from the Energy program’s
graduates regarding how the college program readied them for employment in the Energy
field, and to provide a reflection of their scholastic experience at the college. A survey tool
based on programmatic review guidelines was used to gather information about graduates’
perceptions both in school and if applicable, subsequent employment, regarding how they
felt they were prepared for employment in the energy industry. It was important to
investigate what this new program’s experience meant to the participants, and to determine
what they believed to be the strengths and weaknesses of the program, based on their
perceptions of their experience and preparedness for working in the industry. The survey
was comprised of 20 questions (see Appendix C) asking graduates about their experience
with the program. This survey used a six-point Likert scale including three open-ended
questions asking their perceptions of the program.

To recruit subjects, contact information for all students declaring Energy
Production Technology as their major from 2008-present were petitioned from the
college’s records and registration office. Based on the documentation received from the
records office, there were 125 program graduates at that time. The list provided last
known email addresses and phone numbers for contacting the students. Once the subject
lists were developed, all potential subjects were invited to participate via an email
message. The initial email request was sent out on 6/25/15 and 10 addresses immediately
bounced back as undeliverable. Subsequent follow up emails were sent on 6/30/2015 and 7/20/2015 to provide graduates with a reminder to complete the survey by 7/31/15 to complete. All told, 34 students (n=34) completed the survey out of 115 whose emails did not bounce back, which represents a 30% response rate. Of that group, 18 were employed in the industry and 16 were not.

For question 3 of the survey, respondents were asked about *instructional content and program quality*. The results are presented in Table 5, as broken down by those employed in the industry, those not employed in the industry, and the overall total.

### Table 5

**Students' Perceptions of Instructional Content and Program Quality**

<table>
<thead>
<tr>
<th>Question 3</th>
<th>Employed Y or N</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional content and quality program were: to provide me with strong practical job application experience.</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>1(5.5)</td>
<td>1(5.5)</td>
<td>0(0.0)</td>
<td>8(44.4)</td>
<td>8(44.4)</td>
<td>5.17</td>
<td>1.07</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>2(12.5)</td>
<td>1(6.3)</td>
<td>2(12.5)</td>
<td>1(6.3)</td>
<td>8(50.0)</td>
<td>2(12.5)</td>
<td>4.13</td>
<td>1.58</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>2(5.9)</td>
<td>2(5.9)</td>
<td>3(8.8)</td>
<td>1(2.9)</td>
<td>16(47.1)</td>
<td>10(29.4)</td>
<td>4.68</td>
<td>1.43</td>
</tr>
</tbody>
</table>

*Note.* Likert Scale = Disagree Strongly (1), Disagree Moderately (2), Disagree Slightly (3), Agree Slightly (4), Agree Moderately (5), Agree Strongly (6).

The total mean score regarding *instructional content and program quality* was moderately high at 4.68. Over 78% of the students moderately agreed that the curriculum was designed to provide them with strong practical job application experience. This number is based on an average that included students who stated they were working in the energy industry and those that were not. For the students that attained jobs (N=18) in the energy field, 89% of those students felt the program content and quality was solid, while those that did not get jobs (N=16) came in at 69%. It is important to note that a pattern was revealed throughout this survey that the mean scores from students who did not attain a position in the energy field was much lower on average than students who did gain a
position, which lowers the total mean substantially. The mean scores regarding\ instructional content and program quality\ came in at 5.71 for those with jobs in the energy field and 4.13 for those who did not.

For question 4, students responded to program teaching methods, procedures, and course content. The total mean scores, in Table 6, were moderate with a range of 4.18 – 4.32. Based on the total number of students that responded, over 79% of the graduates felt the materials taught were “current and meaningful,” and over 91% of the students felt that the teaching was “pertinent to their major.” Again, students that were not employed in the energy industry were more likely to rate the pertinent topic lower than those that were employed. It is important to point out that for this particular question, the choice “agree moderately” was inadvertently left out as a choice for selection.

Table 6  
Students’ Perceptions of Program Teaching Methods, Procedures, and Course Content

<table>
<thead>
<tr>
<th>Question 4</th>
<th>Employed Y or N</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. very pertinent to my major.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>6(33.3)</td>
<td>12(66.7)</td>
<td>4.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No (n=16)</td>
<td>0(0.0)</td>
<td>2(12.5)</td>
<td>1(6.3)</td>
<td>9(56.3)</td>
<td>4(25.0)</td>
<td>3.94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tot. (n=34)</td>
<td>0(0.0)</td>
<td>2(5.9)</td>
<td>1(2.94)</td>
<td>15(44.1)</td>
<td>16(47.1)</td>
<td>4.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. very current and meaningful to me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(11.1)</td>
<td>4(22.2)</td>
<td>12(66.7)</td>
<td>4.56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No (n=16)</td>
<td>0(0.0)</td>
<td>3(18.8)</td>
<td>2(11.1)</td>
<td>9(56.3)</td>
<td>4(25.0)</td>
<td>3.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tot. (n=34)</td>
<td>0(0.0)</td>
<td>3(8.8)</td>
<td>4(11.8)</td>
<td>11(32.4)</td>
<td>16(47.1)</td>
<td>4.18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Likert Scale = Disagree Strongly (1), Disagree Moderately (2), Disagree Slightly (3), Agree Slightly (4), Agree Strongly (5).

Pertaining to related and support courses, in Table 7, the total mean scores for question 5 were moderate with a range of 4.65– 4.74. While 88% of the graduates feel the courses taught were “current and meaningful,” an even higher percentage at over 91% of the students felt that the supporting coursework was “pertinent to their major.” The
difference of opinion between those employed in the energy compared with those that were not regarding this topic was minimal.

Table 7

**Students' Perceptions of Related and Support Courses**

<table>
<thead>
<tr>
<th>Question 5</th>
<th>Employed Y or N</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Related and support courses were:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. very pertinent to my major.</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>1(0.0)</td>
<td>3(16.7)</td>
<td>9(50.0)</td>
<td>5(27.8)</td>
<td>5.00</td>
<td>0.82</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>0(0.0)</td>
<td>2(12.6)</td>
<td>0(0.0)</td>
<td>5(31.3)</td>
<td>7(43.8)</td>
<td>2(12.5)</td>
<td>4.44</td>
<td>1.12</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>0(0.0)</td>
<td>2(5.9)</td>
<td>1(2.9)</td>
<td>8(23.5)</td>
<td>16(47.1)</td>
<td>7(20.6)</td>
<td>4.74</td>
<td>1.01</td>
</tr>
<tr>
<td>B. very current and meaningful to me.</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>1(5.6)</td>
<td>3(16.7)</td>
<td>6(33.3)</td>
<td>7(38.9)</td>
<td>4.94</td>
<td>1.13</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>0(0.0)</td>
<td>3(18.8)</td>
<td>0(0.0)</td>
<td>7(43.8)</td>
<td>5(31.3)</td>
<td>2(12.5)</td>
<td>4.31</td>
<td>1.10</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>0(0.0)</td>
<td>3(8.8)</td>
<td>1(2.9)</td>
<td>10(29.7)</td>
<td>11(32.4)</td>
<td>9(26.5)</td>
<td>4.65</td>
<td>1.16</td>
</tr>
</tbody>
</table>

Note. Likert Scale = Disagree Strongly (1), Disagree Moderately (2), Disagree Slightly (3), Agree Slightly (4), Agree Moderately (5), Agree Strongly (6).

Question 6, see Table 8, asked students their perception regarding program work experience. The total mean scores ranged from 3.53 – 4.18, with the highest score being “readily available at convenient times of day,” and the lowest being “strongly coordinated with the employer supervisor.” The difference of opinion regarding this topic between the graduates employed in the energy field to those that were not was quite substantial with an overall mean difference of 1.39. Nearly 69% of the graduates who were not employed in the energy field disagreed that the program work experience was strongly coordinated with the employer supervisor, while 72% of employed students felt that it was. All four points regarding this topic shows a substantial difference in responses.

Table 8

**Students' Perceptions of Program Work Experience**

<table>
<thead>
<tr>
<th>Question 6</th>
<th>Employed Y or N</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>The work experience aspect of the program was:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. readily available at convenient locations.</td>
<td>Yes (n=18)</td>
<td>1(5.6)</td>
<td>3(16.7)</td>
<td>1(5.6)</td>
<td>0(0.0)</td>
<td>1(5.6)</td>
<td>12(66.7)</td>
<td>4.83</td>
<td>1.80</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>3(18.8)</td>
<td>1(6.3)</td>
<td>4(25.0)</td>
<td>4(25.0)</td>
<td>2(12.5)</td>
<td>2(12.5)</td>
<td>3.44</td>
<td>1.58</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>4(11.8)</td>
<td>4(11.8)</td>
<td>5(14.7)</td>
<td>4(11.8)</td>
<td>3(8.8)</td>
<td>14(41.2)</td>
<td>4.18</td>
<td>1.84</td>
</tr>
</tbody>
</table>
Table 8—Continued

<table>
<thead>
<tr>
<th>Question 8 Employed</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. readily available at convenient times of day.</td>
<td>Yes (n=18)</td>
<td>1(5.6)</td>
<td>2(1.1)</td>
<td>1(5.6)</td>
<td>1(5.6)</td>
<td>3(16.7)</td>
<td>3(16.7)</td>
<td>10(55.6)</td>
</tr>
<tr>
<td></td>
<td>No (n=15)</td>
<td>3(13.3)</td>
<td>1(6.7)</td>
<td>3(20.0)</td>
<td>4(26.7)</td>
<td>3(20.0)</td>
<td>1(6.7)</td>
<td>3(40.0)</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=33)</td>
<td>4(12.1)</td>
<td>3(9.1)</td>
<td>4(12.1)</td>
<td>5(15.2)</td>
<td>6(18.2)</td>
<td>11(33.3)</td>
<td>4.18</td>
</tr>
<tr>
<td>C. strongly coordinated with classroom instruction.</td>
<td>Yes (n=18)</td>
<td>1(5.6)</td>
<td>3(16.7)</td>
<td>1(5.6)</td>
<td>2(11.1)</td>
<td>5(27.8)</td>
<td>6(33.3)</td>
<td>4.39</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>3(18.8)</td>
<td>2(12.5)</td>
<td>3(18.8)</td>
<td>5(31.3)</td>
<td>2(12.5)</td>
<td>1(6.3)</td>
<td>3.25</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>4(11.8)</td>
<td>5(14.7)</td>
<td>4(11.8)</td>
<td>7(20.6)</td>
<td>7(20.6)</td>
<td>7(20.6)</td>
<td>3.85</td>
</tr>
<tr>
<td>D. strongly coordinated with the employer supervisor.</td>
<td>Yes (n=18)</td>
<td>1(5.6)</td>
<td>3(16.7)</td>
<td>1(5.3)</td>
<td>2(11.1)</td>
<td>7(38.9)</td>
<td>4(22.2)</td>
<td>4.28</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>5(31.3)</td>
<td>3(18.8)</td>
<td>2(12.5)</td>
<td>5(31.3)</td>
<td>0(0.0)</td>
<td>1(6.3)</td>
<td>2.69</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>6(18.2)</td>
<td>6(18.2)</td>
<td>5(18.2)</td>
<td>7(20.6)</td>
<td>7(20.6)</td>
<td>5(14.7)</td>
<td>3.53</td>
</tr>
</tbody>
</table>

Note. Likert Scale = Disagree Strongly (1), Disagree Moderately (2), Disagree Slightly (3), Agree Slightly (4), Agree Moderately (5), Agree Strongly (6). **33 of 34 students completed this response.

Career planning information was the topic of question number 7, as seen in Table 9. The total mean scores were moderate with a range of 3.38– 4.00 with the highest score being “successfully helped me plan my program,” and the lowest being, “successfully helped me evaluate job opportunities in relation to salary, benefits and conditions of employment.” Topics 7B and 7C were the two areas scored most substantially different by those who were not employed in the energy compared to those who were.

Table 9

Students’ Perceptions of Career Planning Information Provided By The College.

<table>
<thead>
<tr>
<th>Question 7 Employed</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. successfully met my needs and interests.</td>
<td>Yes (n=17)</td>
<td>1(5.9)</td>
<td>2(11.8)</td>
<td>2(11.8)</td>
<td>3(17.7)</td>
<td>4(23.5)</td>
<td>5(29.4)</td>
<td>4.29</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>3(18.8)</td>
<td>6(37.5)</td>
<td>4(25.0)</td>
<td>4(25.0)</td>
<td>0(0.0)</td>
<td>3(18.8)</td>
<td>3.19</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=33)</td>
<td>4(9.1)</td>
<td>8(24.2)</td>
<td>3(9.1)</td>
<td>7(21.2)</td>
<td>4(12.1)</td>
<td>8(24.2)</td>
<td>3.76</td>
</tr>
<tr>
<td>B. successfully helped me plan my program.</td>
<td>Yes (n=18)</td>
<td>1(5.6)</td>
<td>0(0.0)</td>
<td>3(9.4)</td>
<td>2(16.7)</td>
<td>6(33.3)</td>
<td>6(33.3)</td>
<td>4.67</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>3(18.8)</td>
<td>4(25.0)</td>
<td>2(12.5)</td>
<td>3(18.8)</td>
<td>1(6.3)</td>
<td>3(18.8)</td>
<td>3.25</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>4(11.8)</td>
<td>4(11.8)</td>
<td>5(14.7)</td>
<td>5(14.7)</td>
<td>7(20.6)</td>
<td>9(26.5)</td>
<td>4.00</td>
</tr>
<tr>
<td>C. successfully helped me make career decisions and choices.</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>1(5.6)</td>
<td>5(27.8)</td>
<td>3(16.7)</td>
<td>5(27.8)</td>
<td>4(22.2)</td>
<td>4.33</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>4(25.0)</td>
<td>4(25.0)</td>
<td>1(6.6)</td>
<td>4(25.0)</td>
<td>0(0.0)</td>
<td>3(18.8)</td>
<td>3.06</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>4(11.8)</td>
<td>5(14.7)</td>
<td>6(17.7)</td>
<td>7(20.6)</td>
<td>5(14.7)</td>
<td>7(20.6)</td>
<td>3.74</td>
</tr>
</tbody>
</table>
Table 9—Continued

<table>
<thead>
<tr>
<th></th>
<th>Employed Y or N</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. successfully helped me understand rights and responsibilities as an employee.</td>
<td>Yes (n=18)</td>
<td>1(5.6)</td>
<td>0(0.0)</td>
<td>6(33.3)</td>
<td>5(27.8)</td>
<td>3(16.7)</td>
<td>3(16.7)</td>
<td>4.00</td>
<td>1.29</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>3(18.5)</td>
<td>3(18.8)</td>
<td>2(12.5)</td>
<td>3(18.8)</td>
<td>3(18.8)</td>
<td>2(12.5)</td>
<td>3.38</td>
<td>1.69</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>4(11.8)</td>
<td>3(8.8)</td>
<td>8(23.5)</td>
<td>8(23.5)</td>
<td>6(17.7)</td>
<td>5(14.7)</td>
<td>3.71</td>
<td>1.52</td>
</tr>
<tr>
<td>E. successfully helped me evaluate job opportunities regarding salary, benefits and conditions of employment.</td>
<td>Yes (n=18)</td>
<td>2(11.1)</td>
<td>2(11.1)</td>
<td>4(22.2)</td>
<td>2(11.1)</td>
<td>7(38.9)</td>
<td>1(5.6)</td>
<td>3.72</td>
<td>1.48</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>4(25.0)</td>
<td>3(18.8)</td>
<td>3(18.8)</td>
<td>3(18.8)</td>
<td>0(0.0)</td>
<td>2(12.5)</td>
<td>3.00</td>
<td>1.66</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>6(17.7)</td>
<td>5(14.7)</td>
<td>7(20.6)</td>
<td>5(14.7)</td>
<td>7(20.6)</td>
<td>3(8.8)</td>
<td>3.38</td>
<td>1.61</td>
</tr>
<tr>
<td>F. provided by very knowledgeable, interested staff.</td>
<td>Yes (n=18)</td>
<td>1(5.6)</td>
<td>2(11.1)</td>
<td>0(0.0)</td>
<td>1(5.6)</td>
<td>5(27.8)</td>
<td>9(50.0)</td>
<td>4.89</td>
<td>1.46</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>3(18.8)</td>
<td>2(12.5)</td>
<td>1(6.3)</td>
<td>2(12.5)</td>
<td>5(31.3)</td>
<td>3(18.8)</td>
<td>3.81</td>
<td>1.81</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>4(11.8)</td>
<td>4(11.8)</td>
<td>1(2.9)</td>
<td>3(8.8)</td>
<td>10(29.4)</td>
<td>12(35.3)</td>
<td>4.38</td>
<td>1.77</td>
</tr>
<tr>
<td>G. clearly explained non-traditional occupational opportunities.</td>
<td>Yes (n=18)</td>
<td>2(11.1)</td>
<td>0(0.0)</td>
<td>3(16.7)</td>
<td>5(27.8)</td>
<td>6(33.3)</td>
<td>2(11.1)</td>
<td>4.06</td>
<td>1.39</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>4(25.0)</td>
<td>2(12.5)</td>
<td>4(25.0)</td>
<td>2(12.5)</td>
<td>1(6.3)</td>
<td>3(18.8)</td>
<td>3.81</td>
<td>1.78</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>6(17.7)</td>
<td>2(5.9)</td>
<td>7(20.6)</td>
<td>7(20.6)</td>
<td>7(20.6)</td>
<td>5(14.7)</td>
<td>3.65</td>
<td>1.64</td>
</tr>
</tbody>
</table>

Note. Likert Scale = Disagree Strongly (1), Disagree Moderately (2), Disagree Slightly (3), Agree Slightly (4), Agree Moderately (5), Agree Strongly (6). **33 of 34 students completed this response

The total mean scores to question number 8 regarding job success information on former program graduates provided by the college, in Table 10 were agree slightly to agree moderately with a range of 3.21 – 3.58, with the highest score being “clearly conveyed job opportunities available via this occupation,” and the lowest was “clearly told me about job advancement opportunities.” Topics 8B and 8D were the two areas scored most substantially different by those who were not employed in the energy compared to those who were.
Table 10

Students’ Perceptions of Job Success Information on Former Program Graduates

<table>
<thead>
<tr>
<th>Question 8</th>
<th>Employed Y or N</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job success information on former graduates:</td>
<td>Y (n=16)</td>
<td>1(6.3)</td>
<td>0(0.0)</td>
<td>6(37.5)</td>
<td>4(25.0)</td>
<td>3(18.8)</td>
<td>2(12.50)</td>
<td>3.88</td>
<td>1.27</td>
</tr>
<tr>
<td>A. successfully helped me make career decisions.</td>
<td>No (n=16)</td>
<td>7(43.8)</td>
<td>0(0.0)</td>
<td>3(18.8)</td>
<td>4(25.0)</td>
<td>0(0.0)</td>
<td>2(12.50)</td>
<td>2.75</td>
<td>1.75</td>
</tr>
<tr>
<td>Tot. (n=32)</td>
<td>8(25.0)</td>
<td>0(0.0)</td>
<td>9(28.1)</td>
<td>8(25.0)</td>
<td>3(9.4)</td>
<td>4(12.50)</td>
<td></td>
<td>3.31</td>
<td>*1.63</td>
</tr>
<tr>
<td>B. clearly conveyed job opportunities available via this occupation.</td>
<td>Y (n=17)</td>
<td>1(5.9)</td>
<td>0(0.0)</td>
<td>5(29.4)</td>
<td>3(17.7)</td>
<td>6(35.3)</td>
<td>2(11.8)</td>
<td>4.12</td>
<td>1.28</td>
</tr>
<tr>
<td>No (n=16)</td>
<td>5(29.4)</td>
<td>1(5.9)</td>
<td>4(23.5)</td>
<td>3(17.7)</td>
<td>1(5.8)</td>
<td>2(11.8)</td>
<td>3(11.8)</td>
<td>3.00</td>
<td>1.70</td>
</tr>
<tr>
<td>Tot. (n=33)</td>
<td>6(18.9)</td>
<td>1(3.0)</td>
<td>9(27.3)</td>
<td>6(18.2)</td>
<td>7(21.2)</td>
<td>4(12.1)</td>
<td></td>
<td>3.58</td>
<td>**1.60</td>
</tr>
<tr>
<td>C. clearly identified where these job opportunities were located.</td>
<td>Y (n=17)</td>
<td>1(5.9)</td>
<td>1(5.9)</td>
<td>3(17.7)</td>
<td>7(41.2)</td>
<td>3(17.7)</td>
<td>2(11.8)</td>
<td>3.94</td>
<td>1.26</td>
</tr>
<tr>
<td>No (n=16)</td>
<td>3(17.7)</td>
<td>3(17.7)</td>
<td>3(17.7)</td>
<td>3(17.7)</td>
<td>2(11.8)</td>
<td>2(11.8)</td>
<td>3(23.5)</td>
<td>3.25</td>
<td>1.64</td>
</tr>
<tr>
<td>Tot. (n=33)</td>
<td>4(12.1)</td>
<td>4(12.1)</td>
<td>6(18.2)</td>
<td>10(30.3)</td>
<td>5(15.2)</td>
<td>4(12.1)</td>
<td></td>
<td>3.61</td>
<td>**1.50</td>
</tr>
<tr>
<td>D. clearly told me about job advancement opportunities.</td>
<td>Y (n=17)</td>
<td>1(5.9)</td>
<td>0(0.0)</td>
<td>5(29.4)</td>
<td>7(41.2)</td>
<td>3(17.7)</td>
<td>1(5.8)</td>
<td>3.82</td>
<td>1.10</td>
</tr>
<tr>
<td>No (n=16)</td>
<td>5(29.4)</td>
<td>4(23.5)</td>
<td>3(17.7)</td>
<td>2(11.8)</td>
<td>1(5.9)</td>
<td>1(5.8)</td>
<td>3(23.5)</td>
<td>2.56</td>
<td>1.50</td>
</tr>
<tr>
<td>Tot. (n=33)</td>
<td>6(18.9)</td>
<td>4(12.1)</td>
<td>8(24.2)</td>
<td>9(27.3)</td>
<td>4(12.1)</td>
<td>2(6.1)</td>
<td></td>
<td>3.21</td>
<td>**1.45</td>
</tr>
</tbody>
</table>

Note. Likert Scale = Disagree Strongly (1), Disagree Moderately (2), Disagree Slightly (3), Agree Slightly (4), Agree Moderately (5), Agree Strongly (6). *32 of 34 students completed this response. **33 of 34 students completed this response.

Question 9 in Table 11 asked about college placement services. The total mean scores were average with a range of 3.26 – 3.62, with the highest score being “prepared me well to apply for a job,” and the lowest was “successfully helped me find employment opportunities.” The difference of opinion regarding this topic between the graduates employed in the energy field to those that were not was quite substantial with an overall mean difference of 2.25. Over 81% of the graduates that were not employed in the energy field disagree strongly that the placement services at the college successfully helped them find employment opportunities, while 78% of employed students felt that it did. The percentages were equally different regarding placement services preparing graduates to apply for a job. Energy employed graduates felt at rate of over 94% that the college’s placement services were helpful, while 81% of the students without energy jobs saw it
differently. It should also be pointed out that particular topic led the way for the most selections of disagree strongly.

Table 11

Students’ Perceptions of College Placement Services

<table>
<thead>
<tr>
<th>Question 9</th>
<th>Employed Y or N</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placement services at college:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. successfully helped me find employment opportunities.</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>2(11.1)</td>
<td>2(11.1)</td>
<td>6(33.3)</td>
<td>4(22.2)</td>
<td>4(22.2)</td>
<td>4.33</td>
<td>1.25</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>10(62.5)</td>
<td>2(12.5)</td>
<td>1(6.3)</td>
<td>1(6.3)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2.06</td>
<td>1.71</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>10(29.4)</td>
<td>4(11.8)</td>
<td>3(8.8)</td>
<td>7(20.6)</td>
<td>4(11.8)</td>
<td>6(17.7)</td>
<td>3.26</td>
<td>1.87</td>
</tr>
<tr>
<td>B. prepared me well to apply for a job.</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>1(5.6)</td>
<td>7(38.9)</td>
<td>7(38.9)</td>
<td>3(16.8)</td>
<td>4.67</td>
<td>0.82</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>6(37.5)</td>
<td>4(25.0)</td>
<td>3(18.8)</td>
<td>1(6.3)</td>
<td>0(0.0)</td>
<td>2(12.5)</td>
<td>2.44</td>
<td>1.62</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>6(17.7)</td>
<td>4(11.8)</td>
<td>4(11.8)</td>
<td>8(23.5)</td>
<td>7(20.6)</td>
<td>5(14.7)</td>
<td>3.62</td>
<td>1.68</td>
</tr>
</tbody>
</table>

Note. Likert Scale = Disagree Strongly (1), Disagree Moderately (2), Disagree Slightly (3), Agree Slightly (4), Agree Moderately (5), Agree Strongly (6).

The data presented an unanticipated opportunity to analyze an area of college placement services based on the large difference between the means of question 9A comparing those employed in the energy field and who were not. Table 12 presents a t-test of comparison data, and clearly reveals a significant difference. Although it is interesting, nothing is conclusive because of the small sample size.

Table 12

Two-Sample t-Test Assuming Unequal Variances: Q7A. Students’ Perceptions of College Placement Services

<table>
<thead>
<tr>
<th>Employed</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>18</td>
<td>4.33</td>
<td>1.25</td>
<td>4.24</td>
<td>27.0</td>
<td>0.00</td>
</tr>
<tr>
<td>No</td>
<td>16</td>
<td>2.06</td>
<td>1.71</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. p < .05.

In Table 13, the total mean scores for the topic of program occupational instructors were very high with a range of 5.21 – 5.65, with the highest score being “knew the subject matter and occupational requirements well,” and the lowest was “were always available to provide help when I needed it.” The energy graduates either employed in the
field or not, rated the quality of the instructors quite high as all total mean scores were over 5.2.

Table 13

Students’ Perceptions of Program Occupational Instructors

<table>
<thead>
<tr>
<th>Question 10</th>
<th>Employed Y or N</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupational instructors:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. knew the subject matter and occupational requirements well.</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>1(5.6)</td>
<td>3(16.7)</td>
<td>14(77.8)</td>
<td>5.72</td>
<td>.059</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>1(6.3)</td>
<td>5(31.3)</td>
<td>10(62.5)</td>
<td>5.56</td>
<td>.061</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(5.9)</td>
<td>8(23.5)</td>
<td>24(70.6)</td>
<td>5.65</td>
<td>.590</td>
</tr>
<tr>
<td>B. were always available to provide help when I needed it.</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(11.1)</td>
<td>6(33.3)</td>
<td>10(55.6)</td>
<td>5.44</td>
<td>.093</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>3(18.8)</td>
<td>1(6.3)</td>
<td>6(37.5)</td>
<td>6(37.5)</td>
<td>4.94</td>
<td>1.090</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>3(8.8)</td>
<td>3(8.8)</td>
<td>12(35.3)</td>
<td>16(47.1)</td>
<td>5.21</td>
<td>.930</td>
</tr>
<tr>
<td>C. always provided instruction so it was interesting and understandable</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>1(5.6)</td>
<td>5(27.8)</td>
<td>12(66.7)</td>
<td>5.61</td>
<td>.999</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>0(0.0)</td>
<td>1(6.25)</td>
<td>1(6.3)</td>
<td>3(18.8)</td>
<td>4(25.0)</td>
<td>7(43.8)</td>
<td>4.94</td>
<td>1.200</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>0(0.0)</td>
<td>1(2.9)</td>
<td>1(2.9)</td>
<td>4(11.8)</td>
<td>9(26.5)</td>
<td>19(55.9)</td>
<td>5.29</td>
<td>.999</td>
</tr>
</tbody>
</table>

Note. Likert Scale = Disagree Strongly (1), Disagree Moderately (2), Disagree Slightly (3), Agree Slightly (4), Agree Moderately (5), Agree Strongly (6).

The mean scores for program instructional support services in Table 14 were moderate with a range of 4.26-4.41. The highest total mean was “always provided by knowledgeable, interested staff,” and the lowest was “always available to meet my needs and interests.” Both topics were scored substantially different based on the perceptions of those employed in the energy field and those who were not.
Table 14

**Students’ Perceptions of Instructional Support Services**

<table>
<thead>
<tr>
<th>Question 11</th>
<th>Employed Y or N</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional support services (such as tutoring, lab assistance)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. always available to meet my needs and interests.</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>10(55.6)</td>
<td>4(22.2)</td>
<td>4(22.2)</td>
<td>4.67</td>
<td>.082</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>2(12.5)</td>
<td>1(6.3)</td>
<td>2(12.5)</td>
<td>6(37.5)</td>
<td>3(18.8)</td>
<td>2(12.5)</td>
<td>3.81</td>
<td>1.47</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>2(5.9)</td>
<td>1(2.9)</td>
<td>2(5.9)</td>
<td>16(47.1)</td>
<td>7(20.6)</td>
<td>6(17.7)</td>
<td>4.26</td>
<td>1.24</td>
</tr>
<tr>
<td>B. always provided by knowledgeable interested staff</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>1(5.6)</td>
<td>5(27.8)</td>
<td>6(33.3)</td>
<td>6(33.3)</td>
<td>4.94</td>
<td>0.91</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>2(12.5)</td>
<td>1(6.3)</td>
<td>3(18.8)</td>
<td>4(25.0)</td>
<td>4(25.0)</td>
<td>0(0.0)</td>
<td>3.81</td>
<td>1.51</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=33)</td>
<td>2(5.9)</td>
<td>1(2.9)</td>
<td>4(11.8)</td>
<td>9(26.5)</td>
<td>10(29.4)</td>
<td>8(23.5)</td>
<td>4.41</td>
<td>1.35</td>
</tr>
</tbody>
</table>

*Note.* Likert Scale = Disagree Strongly (1), Disagree Moderately (2), Disagree Slightly (3), Agree Slightly (4), Agree Moderately (5), Agree Strongly (6).

Tables 15-17 show respondents’ perceptions of the instructional lecture and lab facilities, instructional equipment, and instructional materials topics. The energy graduates rated the instructional lecture and laboratory facilities quite high. The total mean scores in Table 14 ranged from 5.39 – 5.55. The energy graduates either employed in the field or not, rated the quality of the facilities quite high as all total mean scores were over 5.39.

Table 15

**Students’ Perceptions of Instructional Lecture and Laboratory Facilities**

<table>
<thead>
<tr>
<th>Question 12</th>
<th>Employed Y or N</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional lecture and laboratory facilities:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. always provided adequate lighting, ventilation, heating, power and other utilities.</td>
<td>Yes (n=17)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>3(17.6)</td>
<td>14(82.7)</td>
<td>5.82</td>
<td>0.38</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>1(6.3)</td>
<td>2(12.5)</td>
<td>5(31.3)</td>
<td>8(50.0)</td>
<td>5.25</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=33)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>1(3.0)</td>
<td>2(6.0)</td>
<td>8(24.2)</td>
<td>22(66.7)</td>
<td>5.55</td>
<td><strong>0.74</strong></td>
</tr>
<tr>
<td>B. always included enough work stations for # of students enrolled.</td>
<td>Yes (n=17)</td>
<td>0(0.0)</td>
<td>1(5.9)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>3(17.6)</td>
<td>13(76.5)</td>
<td>5.59</td>
<td>0.97</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(12.5)</td>
<td>1(6.3)</td>
<td>5(31.3)</td>
<td>8(50.0)</td>
<td>5.19</td>
<td>1.01</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=33)</td>
<td>0(0.0)</td>
<td>1(3.0)</td>
<td>2(6.0)</td>
<td>1(3.0)</td>
<td>8(24.2)</td>
<td>21(63.6)</td>
<td>5.39</td>
<td><strong>1.01</strong></td>
</tr>
</tbody>
</table>
In Table 15, respondents’ perceptions of the instructional equipment rated quite high as well. The total mean scores ranged from 5.06 – 5.42. Students felt that the instructional equipment was satisfactory for program use in regard to being up to date, of sufficient quantity, and safe to use. This was also an area where the energy graduates, either employed in the field or not, rated the quality of the equipment high as all total means were over 5.06.

### Table 15—Continued

<table>
<thead>
<tr>
<th>Question 12</th>
<th>Employed Y or N</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. were always safe, functional, and well maintained.</td>
<td>Yes (n=17)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>3(17.7)</td>
<td>14(82.5)</td>
<td>5.82</td>
<td>0.38</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>4(25.0)</td>
<td>4(25.0)</td>
<td>8(50.0)</td>
<td>5.25</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=33)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>4(12.12)</td>
<td>7(21.2)</td>
<td>22(66.7)</td>
<td>5.55</td>
</tr>
<tr>
<td>D. were always available on an equal basis for all students.</td>
<td>Yes (n=17)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>1(5.9)</td>
<td>0(0.0)</td>
<td>3(17.7)</td>
<td>13(76.5)</td>
<td>5.65</td>
<td>0.76</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(12.5)</td>
<td>1(6.25)</td>
<td>5(31.3)</td>
<td>8(50.0)</td>
<td>5.19</td>
<td>1.01</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=33)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>3(9.1)</td>
<td>1(3.03)</td>
<td>8(24.2)</td>
<td>21(63.6)</td>
<td>5.42</td>
<td><strong>0.92</strong></td>
</tr>
</tbody>
</table>

Note. Likert Scale = Disagree Strongly (1), Disagree Moderately (2), Disagree Slightly (3), Agree Slightly (4), Agree Moderately (5), Agree Strongly (6). **33 of 34 students completed this response.

In question 14, students were asked about their perceptions of instructional materials. A good number of students felt that the instructional materials (see Table 17),
was satisfactory for program use in regard to being conveniently located, current, and available at a reasonable cost. The mean scores regarding instructional materials were moderately high with a range of 4.42 - 5.09, with the highest skill score being “always available and conveniently located for use as needed,” and the lowest being “always available at a reasonable cost.”

Table 17
Students’ Perceptions of Instructional Materials

<table>
<thead>
<tr>
<th>Question 14</th>
<th>Employed Y or N</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional materials (e.g., textbooks, reference books, supplies):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. always available and conveniently located for use as needed.</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>1(5.6)</td>
<td>0(0.0)</td>
<td>1(5.6)</td>
<td>4(22.2)</td>
<td>12(66.7)</td>
<td>5.44</td>
<td>1.01</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(12.5)</td>
<td>4(25.0)</td>
<td>7(43.8)</td>
<td>3(18.8)</td>
<td>4.69</td>
<td>0.92</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>0(0.0)</td>
<td>1(2.9)</td>
<td>2(5.9)</td>
<td>5(14.7)</td>
<td>11(32.4)</td>
<td>15(44.1)</td>
<td>5.09</td>
<td>1.04</td>
</tr>
<tr>
<td>B. always current and meaningful to the subject.</td>
<td>Yes (n=18)</td>
<td>1(6.3)</td>
<td>1(6.3)</td>
<td>1(6.3)</td>
<td>4(25.0)</td>
<td>6(37.5)</td>
<td>3(18.8)</td>
<td>4.38</td>
<td>1.63</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>1(2.9)</td>
<td>2(5.9)</td>
<td>1(2.9)</td>
<td>4(11.8)</td>
<td>11(32.4)</td>
<td>15(44.1)</td>
<td>4.97</td>
<td>1.29</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>1(6.3)</td>
<td>3(8.8)</td>
<td>2(5.9)</td>
<td>5(14.7)</td>
<td>17(50.0)</td>
<td>20(58.8)</td>
<td>5.22</td>
<td>0.96</td>
</tr>
<tr>
<td>C. always available at a reasonable cost.</td>
<td>Yes (n=18)</td>
<td>1(5.6)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>5(27.8)</td>
<td>7(38.9)</td>
<td>5(27.8)</td>
<td>4.78</td>
<td>1.18</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>0(0.0)</td>
<td>4(25.0)</td>
<td>2(12.5)</td>
<td>1(6.3)</td>
<td>6(37.5)</td>
<td>2(12.5)</td>
<td>4.00</td>
<td>1.46</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>1(3.0)</td>
<td>4(12.1)</td>
<td>2(6.06)</td>
<td>6(18.9)</td>
<td>13(39.4)</td>
<td>7(21.2)</td>
<td>4.42</td>
<td>1.37</td>
</tr>
</tbody>
</table>

Note. Likert Scale = Disagree Strongly (1), Disagree Moderately (2), Disagree Slightly (3), Agree Slightly (4), Agree Moderately (5), Agree Strongly (6).

The mean scores regarding job skills preparedness in Table 18 were quite high with a range of 4.85 – 5.15. While the highest skill score was “successfully work in teams” and the lowest was “document clearly and effectively” all other statements had a mean score over 4.8. Over 87% of the students felt that they had the appropriate job skills to work in the energy field. It is important to point out that even the students who did not have jobs in the energy field still felt very prepared by the program to work in energy by an average of 81%.
Table 18

**Students’ Perceptions of Job Skills Preparedness**

<table>
<thead>
<tr>
<th>Question 15</th>
<th>Employed Y or N</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall, program prepared me for these job skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. successfully demonstrate safe work habits</td>
<td>Yes (n=18)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>2 (11.1)</td>
<td>5 (27.8)</td>
<td>4 (22.2)</td>
<td>7 (38.9)</td>
<td>4.89</td>
<td>1.05</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>2 (12.5)</td>
<td>3 (18.8)</td>
<td>4 (25.0)</td>
<td>7 (43.8)</td>
<td>5.00</td>
<td>1.06</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>4 (11.8)</td>
<td>8 (23.5)</td>
<td>8 (23.5)</td>
<td>14 (41.5)</td>
<td>4.94</td>
<td>1.06</td>
</tr>
<tr>
<td>B. successfully work in teams</td>
<td>Yes (n=18)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1 (5.6)</td>
<td>3 (16.7)</td>
<td>3 (16.8)</td>
<td>11 (68.8)</td>
<td>5.33</td>
<td>0.94</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>3 (18.8)</td>
<td>2 (12.5)</td>
<td>4 (25.0)</td>
<td>7 (43.8)</td>
<td>4.94</td>
<td>1.14</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>4 (11.8)</td>
<td>5 (14.7)</td>
<td>7 (20.6)</td>
<td>18 (52.9)</td>
<td>5.15</td>
<td>1.06</td>
</tr>
<tr>
<td>C. successfully work independently</td>
<td>Yes (n=18)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1 (5.6)</td>
<td>3 (16.7)</td>
<td>5 (31.3)</td>
<td>9 (56.3)</td>
<td>5.22</td>
<td>0.92</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>3 (18.8)</td>
<td>2 (12.5)</td>
<td>4 (25.0)</td>
<td>7 (43.8)</td>
<td>4.94</td>
<td>1.14</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>4 (11.8)</td>
<td>5 (14.7)</td>
<td>9 (26.5)</td>
<td>16 (47.1)</td>
<td>5.09</td>
<td>1.04</td>
</tr>
<tr>
<td>D. successfully solve complex problems</td>
<td>Yes (n=18)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>1 (5.6)</td>
<td>4 (22.2)</td>
<td>5 (27.8)</td>
<td>8 (44.4)</td>
<td>5.11</td>
<td>0.94</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>1 (6.3)</td>
<td>0 (0.0)</td>
<td>2 (12.5)</td>
<td>2 (12.5)</td>
<td>4 (25.0)</td>
<td>7 (43.8)</td>
<td>4.81</td>
<td>1.42</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>1 (2.9)</td>
<td>0 (0.0)</td>
<td>3 (8.8)</td>
<td>6 (17.7)</td>
<td>9 (26.5)</td>
<td>15 (44.1)</td>
<td>4.97</td>
<td>1.20</td>
</tr>
<tr>
<td>E. document clearly and effectively</td>
<td>Yes (n=18)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>2 (11.1)</td>
<td>3 (16.8)</td>
<td>6 (33.3)</td>
<td>7 (38.9)</td>
<td>5.00</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>1 (6.3)</td>
<td>1 (6.3)</td>
<td>2 (12.5)</td>
<td>1 (6.25)</td>
<td>4 (25.0)</td>
<td>7 (43.8)</td>
<td>4.69</td>
<td>1.57</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>1 (2.9)</td>
<td>1 (2.9)</td>
<td>4 (11.8)</td>
<td>4 (11.8)</td>
<td>10 (29.4)</td>
<td>14 (41.1)</td>
<td>4.85</td>
<td>1.31</td>
</tr>
<tr>
<td>F. communicate clearly and effectively</td>
<td>Yes (n=18)</td>
<td>0 (0.0)</td>
<td>1 (5.6)</td>
<td>1 (5.6)</td>
<td>2 (11.1)</td>
<td>7 (38.9)</td>
<td>7 (38.9)</td>
<td>5.00</td>
<td>1.11</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>1 (6.3)</td>
<td>0 (0.0)</td>
<td>2 (12.5)</td>
<td>2 (12.5)</td>
<td>3 (18.8)</td>
<td>8 (50.0)</td>
<td>4.88</td>
<td>1.45</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>1 (2.9)</td>
<td>1 (2.9)</td>
<td>3 (8.8)</td>
<td>4 (11.8)</td>
<td>10 (29.4)</td>
<td>15 (44.1)</td>
<td>4.94</td>
<td>1.28</td>
</tr>
</tbody>
</table>

Note. Likert Scale = Disagree Strongly (1), Disagree Moderately (2), Disagree Slightly (3), Agree Slightly (4), Agree Moderately (5), Agree Strongly (6).

The mean scores for *Nuclear Uniform Curriculum Program (NUCP) core fundamentals preparedness* were above average with a range of 4.26 – 5.44. The highest skill score was “properties of reactor plant materials,” and the lowest was “computers (plant specific).” Chemistry, item 16F, was the only topic in this area that stood out as substantial between those employed in the energy field and those who were not with a mean difference of 1.41.
Table 19

**Students’ Perceptions of Nuclear Uniform Curriculum Program (NUCP) Core Fundamentals Preparedness**

<table>
<thead>
<tr>
<th>Question 16</th>
<th>Employed Y or N</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall, program prepared me to meet these Nuclear Uniform Curriculum Program (NUCP) core fundamentals:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Mathematics.</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>1(5.9)</td>
<td>1(5.9)</td>
<td>6(33.3)</td>
<td>9(50.0)</td>
<td>5.28</td>
<td>0.87</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>1(6.3)</td>
<td>1(6.3)</td>
<td>2(12.5)</td>
<td>2(12.5)</td>
<td>6(37.5)</td>
<td>4(25.0)</td>
<td>4.44</td>
<td>1.46</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>1(2.9)</td>
<td>1(2.9)</td>
<td>3(8.8)</td>
<td>3(11.8)</td>
<td>12(35.3)</td>
<td>13(38.2)</td>
<td>4.88</td>
<td>1.25</td>
</tr>
<tr>
<td>B. Physics.</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>4(22.2)</td>
<td>4(22.2)</td>
<td>10(55.6)</td>
<td>5.33</td>
<td>0.82</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>2(12.5)</td>
<td>1(6.3)</td>
<td>3(18.8)</td>
<td>6(37.5)</td>
<td>4(25.0)</td>
<td>4.56</td>
<td>1.27</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>2(5.9)</td>
<td>1(2.9)</td>
<td>7(20.6)</td>
<td>10(29.4)</td>
<td>14(41.2)</td>
<td>4.97</td>
<td>1.12</td>
<td></td>
</tr>
<tr>
<td>C. Electrical Sciences.</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>1(5.6)</td>
<td>4(22.2)</td>
<td>6(33.3)</td>
<td>7(38.4)</td>
<td>5.06</td>
<td>0.91</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>1(6.3)</td>
<td>2(12.5)</td>
<td>0(0.0)</td>
<td>5(31.3)</td>
<td>4(25.0)</td>
<td>4(25.0)</td>
<td>4.31</td>
<td>1.49</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>1(2.9)</td>
<td>2(5.9)</td>
<td>1(2.9)</td>
<td>9(20.6)</td>
<td>10(29.4)</td>
<td>11(41.2)</td>
<td>4.71</td>
<td>1.12</td>
</tr>
<tr>
<td>D. Basic Atomic and Nuclear Physics.</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>3(16.7)</td>
<td>3(16.7)</td>
<td>12(66.7)</td>
<td>5.50</td>
<td>0.76</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>1(6.3)</td>
<td>2(12.5)</td>
<td>0(0.0)</td>
<td>5(31.3)</td>
<td>6(37.5)</td>
<td>6(37.5)</td>
<td>4.88</td>
<td>1.32</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>1(2.9)</td>
<td>2(5.9)</td>
<td>1(2.9)</td>
<td>5(14.7)</td>
<td>9(29.4)</td>
<td>18(51.5)</td>
<td>5.21</td>
<td>1.11</td>
</tr>
<tr>
<td>E. Heat Transfer and Fluid Flow.</td>
<td>Yes (n=18)</td>
<td>1(5.6)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>4(22.2)</td>
<td>6(33.3)</td>
<td>7(38.4)</td>
<td>4.94</td>
<td>1.23</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>2(12.5)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>3(18.8)</td>
<td>7(43.8)</td>
<td>4(25.0)</td>
<td>4.56</td>
<td>1.50</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>3(8.8)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>7(20.6)</td>
<td>13(38.2)</td>
<td>11(32.4)</td>
<td>4.76</td>
<td>1.37</td>
</tr>
<tr>
<td>F. Chemistry.</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>5(27.8)</td>
<td>4(22.2)</td>
<td>9(50.0)</td>
<td>5.22</td>
<td>0.85</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>3(18.8)</td>
<td>1(6.3)</td>
<td>2(12.5)</td>
<td>2(6.3)</td>
<td>6(37.5)</td>
<td>2(12.5)</td>
<td>3.81</td>
<td>1.70</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>3(8.8)</td>
<td>1(2.9)</td>
<td>2(5.9)</td>
<td>7(20.6)</td>
<td>10(29.4)</td>
<td>11(32.4)</td>
<td>4.56</td>
<td>1.50</td>
</tr>
<tr>
<td>G. Properties of Reactor Plant Materials.</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(11.1)</td>
<td>2(11.1)</td>
<td>14(77.9)</td>
<td>5.67</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>1(6.3)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(12.5)</td>
<td>5(31.3)</td>
<td>8(50.0)</td>
<td>5.19</td>
<td>1.07</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>0(0.0)</td>
<td>1(2.9)</td>
<td>0(0.0)</td>
<td>4(11.8)</td>
<td>7(20.6)</td>
<td>22(64.7)</td>
<td>5.44</td>
<td>0.91</td>
</tr>
<tr>
<td>H. Radiation Detection and Protection-</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(11.1)</td>
<td>4(22.2)</td>
<td>2(11.1)</td>
<td>10(55.6)</td>
<td>5.11</td>
<td>1.10</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>1(6.3)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>3(18.8)</td>
<td>5(31.3)</td>
<td>7(43.8)</td>
<td>5.00</td>
<td>1.27</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>1(2.9)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(15.7)</td>
<td>7(20.6)</td>
<td>17(50.0)</td>
<td>5.06</td>
<td>1.19</td>
</tr>
<tr>
<td>I. Reactor Plant Protection and Safety.</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>1(5.6)</td>
<td>0(0.0)</td>
<td>3(16.7)</td>
<td>3(16.7)</td>
<td>11(61.1)</td>
<td>5.28</td>
<td>1.10</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>0(0.0)</td>
<td>1(6.3)</td>
<td>1(6.3)</td>
<td>0(0.0)</td>
<td>5(31.3)</td>
<td>9(56.3)</td>
<td>5.25</td>
<td>1.15</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>0(0.0)</td>
<td>2(5.9)</td>
<td>1(2.9)</td>
<td>3(8.8)</td>
<td>8(23.5)</td>
<td>20(58.8)</td>
<td>5.26</td>
<td>1.12</td>
</tr>
<tr>
<td>J. Computers (plant specific).</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>3(16.7)</td>
<td>6(33.3)</td>
<td>5(27.8)</td>
<td>4(22.2)</td>
<td>4.56</td>
<td>1.01</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>1(6.3)</td>
<td>3(18.8)</td>
<td>2(12.5)</td>
<td>3(18.8)</td>
<td>4(25.0)</td>
<td>3(18.8)</td>
<td>3.94</td>
<td>1.56</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>1(2.9)</td>
<td>3(8.8)</td>
<td>5(14.7)</td>
<td>9(26.5)</td>
<td>9(26.5)</td>
<td>7(24.2)</td>
<td>4.26</td>
<td>1.34</td>
</tr>
<tr>
<td>K. Basic Systems Knowledge.</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>1(5.6)</td>
<td>0(0.0)</td>
<td>1(5.6)</td>
<td>4(22.2)</td>
<td>12(66.7)</td>
<td>5.44</td>
<td>1.01</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(2.9)</td>
<td>9(56.3)</td>
<td>5(31.3)</td>
<td>5.19</td>
<td>0.63</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>0(0.0)</td>
<td>1(2.9)</td>
<td>0(0.0)</td>
<td>3(8.8)</td>
<td>13(38.2)</td>
<td>17(50.0)</td>
<td>5.32</td>
<td>0.87</td>
</tr>
<tr>
<td>L. Basic Components Knowledge.</td>
<td>Yes (n=18)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(11.1)</td>
<td>1(5.6)</td>
<td>4(22.2)</td>
<td>11(61.1)</td>
<td>5.33</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(12.5)</td>
<td>8(50.0)</td>
<td>6(37.5)</td>
<td>5.25</td>
<td>0.66</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=34)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(5.9)</td>
<td>3(8.8)</td>
<td>12(35.3)</td>
<td>17(47.1)</td>
<td>5.29</td>
<td>0.86</td>
</tr>
</tbody>
</table>

*Note: Likert Scale = Disagree Strongly (1), Disagree Moderately (2), Disagree Slightly (3), Agree Slightly (4), Agree Moderately (5), Agree Strongly (6).*
Question 17 asked about overall preparedness as seen in Table 20. The total mean score to this topic was 4.18. This was another topic that saw a substantial difference in scores between those employed in the energy field and those who were not. The mean score difference was 1.44 with 88% of those employed feeling prepared compared to 56% of those not employed in the industry.

Table 20   
*Students’ Perceptions of Overall Preparedness*

<table>
<thead>
<tr>
<th>Question 17</th>
<th>Employed Y or N</th>
<th>Disagree Strongly n (%)</th>
<th>Disagree Moderately n (%)</th>
<th>Disagree Slightly n (%)</th>
<th>Agree Slightly n (%)</th>
<th>Agree Moderately n (%)</th>
<th>Agree Strongly n (%)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall the Energy Production Technology Program: successfully prepared me well for a career in the energy industry.</td>
<td>Yes (n=17)</td>
<td>0(0.0)</td>
<td>1(5.9)</td>
<td>1(5.9)</td>
<td>4(23.5)</td>
<td>4(23.5)</td>
<td>7(41.2)</td>
<td>4.88</td>
<td>1.18**</td>
</tr>
<tr>
<td></td>
<td>No (n=16)</td>
<td>4(25.0)</td>
<td>1(6.6)</td>
<td>2(12.5)</td>
<td>4(25.0)</td>
<td>3(18.7)</td>
<td>2(12.5)</td>
<td>3.44</td>
<td>1.73</td>
</tr>
<tr>
<td></td>
<td>Tot. (n=33)</td>
<td>4(12.1)</td>
<td>2(6.1)</td>
<td>3(9.4)</td>
<td>8(24.2)</td>
<td>7(21.2)</td>
<td>9(27.3)</td>
<td>4.18</td>
<td>1.64</td>
</tr>
</tbody>
</table>

*Note. Likert Scale = Disagree Strongly (1), Disagree Moderately (2), Disagree Slightly (3), Agree Slightly (4), Agree Moderately (5), Agree Strongly (6). **33 of 34 students completed this response.*

Questions 18-20 were opened-ended opportunities asking students where they felt they were either best or least prepared as they graduated from the program while also providing additional space for comments or suggestions. Additional comments were provided by 22 of the 34 graduates that responded to the survey. In terms of being best prepared, most student comments focused on key instructional topics such as: nuclear fundamentals, radiation protection, and systems. Others reflected on how well prepared they felt for working in the industry. The areas where students felt least prepared had to do with the employment entrance exams and the interview process. More than one student also commented on the need for more hands-on experience in the technical areas such as: instrumentation and control or radiation protection. Additional comments or suggestions students had for the program centered on the need to have more employment
opportunities offered. “More internships!” lamented one student. The largest amount of feedback in the additional comments was undoubtedly the frustration some students felt regarding the lack of employment opportunities. Several students made comments regarding the inability to get a job at the local plants because they neither had a family member that worked at the plant that would help them get a job or they did not have previous time in the Navy.

To summarize the responses for research question 3, the 34 program graduates who responded to the study overall felt they were prepared for employment. For the most part, students were content with the topic areas such as: instructional facilities, instructional materials, instructional equipment, NUCP preparedness and the program instructors. Areas where most students were not as content included: career planning information provided by the college, job success information from former program graduates, and college placement services.

**Chapter IV Conclusion**

The perceptions of each subject in this study made it clear that the Energy Production Technology program at this college, generally prepared graduates well, for a career in the energy industry. These findings in Chapter IV were provided by analysis from three separate groups that included 45 individuals.

From the viewpoint of the business and industry advisory committee created to oversee the Energy Production Technology degree program, the program was successful for creating a worker pipeline; unfortunately there were not enough jobs to go around for all of the graduates. The group was also conflicted regarding the success of the feedback loop between the student, employer, and advisory committee.
From the viewpoint of the power plant employer, although they believed that Energy Production Technology program graduates had the core technical skills necessary to prepare them for employment, they stressed that the military recruits were better prepared regarding the specific skill areas linked to “nuclear culture.”

From the viewpoint of the program’s graduates, students felt they were adequately prepared for employment. However it should be noted that opinions varied on several topics based on whether or not the students were employed in the energy industry. The results and conclusions drawn from this study along with recommendations will be presented in Chapter V.
CHAPTER V
DISCUSSION

The purpose of Chapter V is to present a recap of the key findings from the study and to provide some closing statements. This chapter (1) summarizes the results of the study; (2) introduces the conclusions; (3) describes recommendations for additional research; (4) provides strengths and limitations of the present study; and (5) presents implications for educational leadership and vocational education.

The purpose of this mixed methods study was to determine the success of an Energy Production Technology (EPT) degree program within one Midwest community college created in partnership with its local business and industry service district (energy production industry). This study investigated the concerns, ideas, and recommendations for understanding current practices or sustaining those that best meet the needs of the stakeholders regarding development and implementation of the EPT program. It was essential to assess the feedback process within this partnership to determine if the program was yielding effective results as perceived by program graduates and their employers. Equally important was to determine the role played by the advisory committee that was developed to implement and provide oversight to the program.

According the American Association of Community Colleges (2012), “Community colleges are valuable in helping meet the needs of a competitive global economy and advancing a state’s economic growth by providing services to business and organizations” (para. 3). The problem is that businesses and organizations in many career areas currently have an urgent need for filling multifaceted and challenging job vacancies. Therefore, one goal of community colleges is to ensure that the workers in the
region they serve have the educational tools needed to survive in today’s job market. In order for any degree program to remain viable and relevant, it must prepare highly skilled individuals who align with the changing needs of a given industry. To do this, the labor force and educational organizations need to be structured around integrated education, training, and program evaluation processes (Government Oversight Office 2008). For employers, this extended effort provides opportunities for recruiting and training new employees, increasing additional skills for incumbents and potentially improving employee retention.

Assessing the success of a program is vital to provide the best service to stakeholders. According to Epstein, Coates, Wray, and Swain (2006), “The stakeholder’s role is broader than being a customer of services, because the conditions citizens experience in the community and in their lives are affected by many things other than community services” (p. 22). A region’s ability to be competitive depends on the capacity of its workforce. To succeed in building that capacity, the strategic actions of all stakeholders must embrace the current and emerging changes in the economy. Success depends entirely on how community colleges, along with their region’s stakeholders, can effectively collaborate and bring collective resources to bear on the challenges facing them. As discussed in Chapter II, a review of the literature identified a void in this area of research in regard to partnerships among nuclear plants and community colleges. Chapter V will discuss to what extent this study answered the research questions and how it adds to the literature on technical program evaluation.

**Summary and Discussion of the Findings**

The strategy behind the conceptual framework of this study was to make the
advisory committee, the third-party curriculum review process (NUCP), and supplying adequately-prepared employees the central focus of establishing an energy program at the college in regard to its development, evaluation, employer and student perceptions, and potential improvement. As graduates attained employment in the industry, a continual feedback loop of evaluation and improvement needed to be developed in order to best assess the validity of the training provided by the college.

What the findings of this study brought to light was that through the guidance of the advisory committee, the college developed a program supported by the NUCP and the outcome was qualified graduates. What was also evident was that the feedback loop generally worked when it happened, but there were times when it did not always happen and issues went unresolved. Based on this, a key update to the conceptual framework would be to develop checks and balances to the feedback loop process by incorporating more intrusive opportunities for feedback such as holding monthly outreach sessions to employers.

Three research questions directed this study. The intent of those questions was to: (1) determine the perceptions of the advisory committee participants regarding their role with the program including questions about curriculum, equipment, facilities and job placement; (2) understand the perceptions of employers regarding how the college program prepared students for employment in the Energy field; and (3) ascertain program participants’ perceptions about how the college program readied them for employment in the Energy field and to provide a reflection of their scholastic experience at the college. Through interviews of the advisory committee and the employers while also surveying
the students, several themes emerged centering around the research questions that guided this study.

**Research Question One**

The first research question asked the advisory committee participants their perceptions of their role regarding the program including questions about curriculum, equipment, facilities and job placement. Key themes emerged from discussions during open-ended interviews with the advisory committee members. In general, those were: (1) program has created a worker pipeline; (2) be sure to involve the right stakeholders; (3) program not adequately preparing graduates to pass the pre-employment test; and (4) need a better understanding of balance between labor supply and demand. The following sections will discuss the themes in greater detail.

**Theme one: Program has created a worker pipeline.** As reported in Chapter I, more than 40 community colleges across the United States have begun to partner with the nuclear industry to implement programming to ensure that the colleges have the tools needed to educate future nuclear workers, and that the nuclear industry is supplied with capable, highly-trained workers for the future (NEI, 2010). With two local nuclear plants in the region, the principal objective for developing the Energy Production Technology program was to help fill the staffing needs of the industry suggested by the NEI, that were beginning to happen due to retirements and a deemed lack of a skilled workforce. When asked the question regarding the subject of how successful was the program for establishing a pipeline for a new workforce, each member of the advisory committee interviewed overwhelming stated that the program was doing what it had intended. With at least 45 of the program graduates presently employed in the energy industry, the
advisory committee commented positively that the college did indeed put in place an adequate pipeline of qualified employees.

Historically, the commercial nuclear industry counted on high-tech military programs to provide technicians for civilian jobs but, according to the NEI (2010) “to develop the next-generation work force, the U.S. nuclear industry is working with community colleges to recruit and train students in a standardized way for employment at nuclear utilities” (p. 2). The group felt that the college was filling the void locally as some of the traditional pipelines, like the nuclear Navy, no longer provided a consistent flow of individuals for them to hire.

It was also mentioned often during the discussions the importance of building a local or regional pipeline in proximity to the power plants. A continual problem that came up during the interviews was that it was common to hire an individual from outside the region and as soon as they got their licenses, or as soon as they were qualified or a fully-qualified Non-Licensed Operator (NLO), they would leave to return to their hometown utility when a job was available. Approximately 18 months of training is a substantial expense to a plant that was intending to hire that individual. This issue also helped foster the development of the NUCP process. By evaluating and accrediting the community college training programs, power plants could have more confidence in hiring local graduates with a potential cost-savings due to waiving of, or exemption from training.

**Theme two: Be sure to involve the right stakeholders.** MacAllum and Yoder (2004), in their report *The 21st-Century Community College: A Strategic Guide to Maximizing Labor Market Responsiveness*, advocated that community colleges build
strategic partnerships with business and industry in order for all stakeholders to flourish. When EPT advisory committee members were asked to provide some advice for other schools looking to start a comparable program, teaming up with key stakeholders was the most common takeaway from the group. A shared focus was that it was extremely important to get the “right” people involved with the program, like technical experts, human resources, and policy makers so key decisions can be made to help guide it. This is supported by Bunn and Stewart (1998), who stated “Avenues must be opened and dialogue within and among all partners must be strengthened” (p. 10). It was also noted that the most successful NUCP programs had really “tight relationships” between the employer and school which can help steer the program beyond some of the potential pitfalls that could hinder its success.

Although it was mentioned in the interviews that the college did an excellent job engaging local stakeholders, it was also noted that the “right” individuals may not have always been in the room. For example, after a couple of years into the development of the program, it was obvious that the college needed to connect better with the power plants’ human resource (HR) staff because of their role in hiring graduates. All of the individuals on the initial advisory committee were from the technical areas and, although they could speak easily to what the students needed to know and were excited about being a part of this new development, these plant representatives were not necessarily connected to the their respective HR staff. In some aspects, the HR departments were not fully aware of the college’s program. This comment is not a disparagement to the committee members, it is just that these plants are very large and not every department is directly connected. Also, much of this oversight had to do with the fact that there was so
much work involved with getting the program up and running on a technical front, not every base was always covered.

A key addition that one partner made to remedy this, was that on their employment site, for technical positions, potential employees would be prompted to answer the question whether or not they graduated from the college’s energy program. This was an important implementation that gave EPT graduates more promotion within the plant. It should be noted that this change was not a result of the study, although it was highlighted by an advisory committee member during the interview process. Another key implementation to get HR more involved was the addition of group interview sessions. HR personnel from the plant set up a group interview sessions and interviewed students much like they would in the plant. The interviewers would then critique responses so students would get a better sense of how to perform in the actual interview. Again, although not a result of this study, more than one student responded positively to this in the open-ended portion of the survey.

Another aspect of research question number 1 was concerning feedback regarding NUCP outcomes. Overall, the respondents were disappointed with the lack of feedback received from energy employers regarding program outcomes. Based on feedback from several advisory committee members, some outcomes were not addressed immediately and it sometimes hurt the reputation of the program. For example, respondents commented on situations where the plants hired individuals in a job area outside of the concentration that the students were trained in. One particular incident, when the student faltered, the supervisor of the student singled out the college as not training the student properly. Because this particular supervisor was not initially connected to the advisory
committee, he was not involved in the feedback loop nor did he know to connect to college staff for follow up.

Although disappointed, there were on more than one occasion where the plant talked to the college about a shortcoming with training at the college and changes were then made to the curriculum. For example, during the training of the first class of Non-Licensed Operator (NLO) trainees that included EPT students, it was reported by the lead NLO trainer at the plant, that two of the college’s students were struggling to successfully pass training exams in the specific NLO coursework. A meeting was scheduled between college officials and the lead trainer to discuss the options for the students while reporting out the outcomes on the exams both students repeatedly did poorly on. During this report out, it was immediately noticed that the students did not complete any courses at the college that directly aligned with the NLO training curriculum. It was further observed that neither student graduated from a concentration that aligned with the NLO position. It became evident that although the plant was looking to support the program by hiring EPT students, some were hired that may have not been best suited for certain positions. To better strengthen the program and to help students in all concentrations, additional curriculum was added to the program to better help students that may apply for positions outside of their concentration. This addition was not reflective of the present study, it did however provide support as to why the feedback loop needed to be improved.

Theme three: Program not adequately preparing graduates to pass the pre-employment test. In the literature it was commonly noted that throughout the workforce, general nuclear awareness is a prerequisite, with more specialized nuclear expertise being required by fewer personnel, depending on the specific job requirements. According to
the a report by the OECD (2012), the threefold categorization of the competencies necessary to run a nuclear power plant are: (1) “nuclear” people; (2) “nuclearized” people; and (3) “nuclear-aware” people; each requiring, dependent on job title, a different level of nuclear awareness to work successfully in the industry. A better understanding of the nuclear culture and the stringent requirements of it, was another area that the committee felt was a lesson to pass on to others looking to develop a program. Indeed, this was a hot button topic amongst all three groups (students, employers, advisory committee).

One key nuclear-specific concept that the committee failed to take into account during the development of the program was the integration of pre-employment testing. The lack of success regarding the passing of the employment entrance examination that is required by certain areas to attain a position was pointed out by the advisory committee members as a huge gap. One of the advisory committee members phrased it as “demoralizing” for a student to go through the program and not be able to get a job in the industry because of the entrance examination. The students felt the same way as many noted their discontent regarding the tests in the open-ended portion of the survey.

When the program was first developed, the notion of pre-employment testing was not an issue strongly discussed by the advisory committee; it was an afterthought. When discussed later amongst the group, part of the issue was that none the present advisory committee members had to take the test. They were either engineers in the plant that were not required to take the test or individuals that were hired prior to this requirement and were grandfathered in. When the curriculum for the program was developed by the committee, it was not done as such that it transitioned easily into successful exam scores. For example, the employment entrance exam is a timed test and there presently is not a
single class that the students take in the program where they are subjected to timed tests. Students were not prepared for the test and this lack of success also hurt the standing of the program.

An additional distinction of the employment entrance exam is, if students fail one aspect of the test, they fail the whole test, therefore they cannot be hired to work at the nuclear plant in those job capacities until they have successfully passed all portions of it. Also, students are left to speculate what subject area of the test they failed as they are not told leaving no focused opportunity for remediation. These issues caused big concerns with many of the plants having standing rules where an individual has to wait 30-60 days to take the test again. There is obviously no guarantee that there will be another position available once that timeframe has ended. This also kept students from trying to get other jobs in between testing dates.

To address the issue of test preparedness, the college set up mock testing sessions to mirror what could potentially happen at the plant. Each power plant offers sample paper tests online that are comparable to the actual test. Although students could do this on their own, the premise was that if there was an environment that reflected what students would be subjected to, students would be better prepared. Over the course of a few years the college ran several mock testing sessions with over 90 students completing the exam. Most students commented later that the mock exam process was very comparable to the real test and was well appreciated. The main difference was that the mock test provided students with their results which allowed for remediation in specific areas of the test if necessary.
In 2010 and 2011 EEI (Edison Electric Institute) offered to provide testing dates for EPT students to take the employment entrance exams and have their scores stored in the national database for access to all plants. This was a one-time opportunity to students as presently, employment tests are only offered when jobs are available at the power plants. Also, the plant where the students take their test does not submit it nationally for use at other plants unless a potential employee authorizes its release. An outcome realized by the EEI sponsored testing was that students received a note stating, based on their test scores, what percentage of the plants in the country they could work for. Different plants set their plateaus for hiring at different levels. For example, students figured out that locally, one of the plants had higher cut scores than the other.

**Theme four: Need a better understanding of balance between labor supply and demand.** When developing a new program at any college, there must be coordination across key state and local stakeholder agencies. According to a report by MPR Associates (2010), “Development of programs of study includes analysis of current labor market information to determine which programs of study will truly result in high demand jobs” (p. 15). Having a better understanding of supply and demand was another key lesson suggested by advisory committee members who were interviewed. According to this group, colleges or technical schools looking to start a program need to make sure that the program is aligned to the specific labor needs of the school’s surrounding region based on what the school has the capacity to supply.

In other words, energy leaders in the area were projecting that the region needed 300-500 employees over the course of the next five years (2008-2013). Lost in the translation however, was whether these numbers included every potential job
classification in the power plants and if so, what percentage of the 300-500 were technical positions that could be supplied by the community college? In addition to not completely connecting with local HR at the plants, there was also one key question that was not asked: What percentage of the nearly 38% of the nuclear industry work force that are eligible to retire within the next five years, and the 25,000 more workers needed by 2015 to maintain the current work force, would only require an associate degree? Based on this, right sizing the program was a common point of discussion for obvious reasons, because making sure to have the right balance of labor supply and demand is important to the success of the program.

Having the right balance of supply and demand is not the sole factor as there are sometimes other influences involved that affect hiring. For example, at the end of the spring semester in 2011 over 87 students graduated from the program and 54 of them still did not have jobs in the industry. Unfortunately, as disappointed as the students were, so was the advisory committee, and they alluded to the economy as a driving factor behind the lack of hiring not the correct balance of supply and demand. In one advisory committee meeting, a plant official reported that only 40% of those that the plants anticipated to retire actually were retiring. Employees were afraid to leave when they lost most of their 401k dollars in 2009. This coupled with the lack of an in-depth environmental scan and needs analysis: and scarce involvement from plant HR staff, what came to light is that it was probably irresponsible to let the program expand to 230 students. Based on advice from the committee, one conclusion of this study is to establish a cap for the program based on a realistic assessment of the need for graduates.
To summarize research question one, from the viewpoint of the business and industry advisory committee created to oversee the Energy Production Technology degree program, the program was successful for creating a worker pipeline; unfortunately there were not enough jobs to go around for all of the graduates. The group was also conflicted regarding the success of the feedback loop between the student, employer, and advisory committee in order for the program to successfully maintain program outcomes as required by Nuclear Uniform Curriculum Program. Several committee members commented that the feedback loop worked when it happened, but feedback was seldom provided by the plants based how the program graduates were doing.

The interviews for the study also served as a reflection and summary of the key events for the advisory committee during the program development. Important points that surfaced during the actual study were: making sure the college has the right stakeholders at the table, making sure that the students are better prepared for the nuclear culture which includes the entrance exams, while also understanding the market necessary for a right sized student population. A key addition to the literature would be how the findings in this study corroborated with the key principles from the experts (like the importance of nuclear culture, stakeholders and labor demand) in the OECD and MPR reports cited.

**Research Question Two**

The second research question sought information from individuals that have employed students from the college’s energy program regarding their perceptions about how the college program prepared students for employment in the Energy field. Employers were also asked to complete a skills checklist as well. Analysis of the
interview data provided dominant themes that participants viewed as significant factors regarding the college’s program. The three common themes that emerged were: (1) students are well prepared on core technical skills; (2) individuals from the military are better prepared; and (3) the program needs to better prepare students for the “nuclear culture.”

**Theme one: Students are well prepared on core technical skills.** In his book, *The Labor Storm*, Wolfe (2006) contends, that in interview after interview, leader after leader has shared that finding skilled and semi-skilled workers is becoming more challenging than ever. The energy employers of the region agreed that to find the necessary technical staff beyond the current labor pool which existed previously in the military was a must. According to NEI (2010), the NUCP was developed to guide community colleges in helping power plants staff their future technical workforce. This notion is supported by Bailey and Morest (2004), Muilenburg (2009), and Brock (2010), who believe community colleges historically are nimble, quick to respond and have shown substantial growth and importance in providing technical training.

Based on both the interview responses and the replies to the skills checklist (see Tables 1-3), employers from each plant agreed that the college has developed a technical program providing the core technical skills necessary to work in the energy industry. Key skills that were corroborated between the interviews and the checklist included the ability to successfully demonstrate safe work habits, work in teams, work independently, and communicate clearly and effectively (Chapter IV, Table 1). Employers also applauded the EPT graduates’ strong technical skills while also having the capacity “to get things done.” Computer skills, basic systems and basic components knowledge (Chapter IV, Table 2)
were some of the key technical concepts graduates had a strong grasp of according to the responders.

The strong preparation in the technical area is in alignment with what has already been discussed. Founding members of the advisory committee were mostly involved in the technical areas at the plant so they were very aware what technical skills were necessary to be successful. In fact, several of them were trainers at the plant and then became adjunct faculty for the college. One key strength for the program was that all the individuals teaching nuclear-focused courses for the college also had taught similar subject matter at the plant.

Electrical Sciences, Heat Transfer and Fluid Flow, and Chemistry (Chapter IV, Table 2) were areas the four supervisors noted that students needed work. It should be pointed out that the students felt that Chemistry, (Chapter IV, Table 17) was also a skill they were not as well prepared for. Some of the shortcomings regarding these areas are due to the initial concentration alignment and the timing it took to get courses aligned to the NUCP. Although the college offered the first energy class in September 2008, it took until August of 2013 to get the gap analysis and proper course alignment done, with the nuclear-related chemistry course being the last course added. Chemistry was uncovered during the study as a shortcoming by the students and employers alike. Many of the graduates with jobs at the plant were employed by this time potentially, missing out on some of the key curriculum revisions.

**Theme two: Individuals from the military are better prepared.** When asked how Energy Production Technology graduates from the college compare to those graduates from other technical programs (military, other colleges), all respondents...
overwhelmingly felt that the military has an advantage. Although EPT students were
prepared academically, they were not as prepared for the nuclear part of life that the
military recruits live every day. The students have part time jobs and some may even be
part time students but they are generally not as “nuclear-aware,” as individuals coming
from the nuclear navy that spend 40 hours a week working in an environment comparable
to that of a power plant. The responses to this question also aligned with the comments
employers had when they were asked what key jobs skills EPT students were least
equipped with. Also, in the open-ended comments section of the student survey, many
students alluded to the fact that the navy recruits had an advantage because of their on-
the-job experience in the Navy.

Theme three: The program needs to better prepare students for the “nuclear
culture.” As alluded to earlier, based on the responses to the skills checklist, employers of
EPT graduates agreed that graduates were prepared for employment. Very much aligning
with comments regarding the military recruits, employers felt that some graduates lacked
the nuclear knowledge that would be helpful as an employee in the nuclear field. Because
of the exactness of the industry there are a lot of specific soft skills, human performance
type items, three-way communication, procedure use, adherence, protocols, and self-
checking techniques that are necessary. As mentioned in Chapter I, the unique features of
nuclear energy and its procedures present distinctive requirements for the education and
training of its workforce.

Although there is a course in the curriculum that discusses some of the unique
energy fundamentals, this three-credit course cannot supplant the material comparably to
what the experience in the navy provides. Although the study reported that the EPT
graduates are not as prepared, as one employer stated, it does not take long for the students to catch up.

From the viewpoint of the power plant employer, they believed that EPT graduates were adequately prepared for employment, although they felt that the military recruits were better prepared based on the culture in which they work. This was viewed as a shortcoming for graduates at the onset of their employment but employers stated that EPT graduates did catch up with their military colleagues as they spent more time in the nuclear culture.

**Research Question Three**

The third research question looked to the Energy program’s graduates for their perceptions regarding their program experience. A survey tool consisting of 20 questions asking about how they felt the program prepared them for employment in the energy industry was administered to 34 graduates.

Overall the students moderately agreed that the curriculum was designed to provide them with strong practical job application experience. Most of the graduates felt the materials taught were “current and meaningful,” and also believed that the teaching was “pertinent to their major.” Students throughout the survey, gave high marks to the instructors. Comparable to the comments made about course materials, students also responded positively when asked about related and supporting coursework. Through a review of the data, it is important to note that a pattern was discovered throughout this survey that the mean scores from students who did not attain a position in the energy field were quite lower on average than students who did gain a position, which lowers the total
mean substantially. The comments from the open-ended questions from those that did not get jobs were also less positive.

One area the study uncovered that was not so positive was when graduates were asked about specific work experience topics. The difference in volatility when comparing the answers between those employed in the industry and those that were not is evident. For example, nearly 72% of the graduates that were employed in the energy field agreed that the program work experience was strongly coordinated with the employer supervisor while only 31% of the graduates not employed in the industry felt the same. All four points addressed by this particular -- day availability, location availability, coordination with instruction, and coordination with employer -- a substantial difference in their perceptions. Based on responses to this study, much of the moderate negativity regarding lack of coordination for work experience is linked to the lower percentage of students having jobs. Some of the negative responses can also be attributed towards the volatility some of the students felt towards the college who did not get a job in the energy field. Based on personal knowledge, many graduates harbored some resentment towards the college when they did not attain a position at a power plant.

Another topic linked to work experience that was discovered as a point of contention for those who were and were not employed in the energy field was career planning and placement information. It was discovered that over 80% of the graduates that were not employed in the energy field disagree strongly that the placement services at the college helped them at all. When it comes to the topic of “successfully helped me find employment opportunities,” it should be pointed out that particular topic had the highest selection of “disagree strongly” of any topic. Outside of the scope of this study,
it should be noted that the topic of career planning information and career placement has always been an issue for students at the college as the college does not have any full time career planning staff. Also, because this was a new program, and the focus was on the technical aspect of the development, career planning and career placement information was also an area that was not taken into full account when the program was in development and was corroborated by the student survey.

Regarding the topic of former graduate success, because there is not any current information for this, an assumption could have been made regarding this topic that students would have continued to respond negatively because of its link to the topic of jobs. However, the results of the study were in alignment with what the college currently provides for this program. For example, the college’s lead technical advisor sends out an email blast to all energy students each time he is made aware of a new position, so it makes sense, however slightly that “clearly conveyed job opportunities available via this occupation,” is the highest scored response. Because a main goal of the program is to develop entry-level employees nor is the college currently privy to “job advancement opportunities,” it makes sense that the students scored lower on this topic.

When asked about the program’s occupational instructors, the energy graduates either employed in the field or not, rated the quality of the instructors very high. Comments made in the open-ended section at the end of the survey made reference to the high level of instruction. The college was very fortunate in this area of the program because since the beginning of the program, there has been no shortage of qualified individuals available and wanting to teach. The only issue pointed out by students in the study, was sometimes the instructors’ lack of availability, but as the energy coursework
was taught almost exclusively by adjuncts, it is difficult at times for the instructors to find time outside of class to help students that needed it.

Linked to the lack of availability at times to connect with instructors after hours, it was discovered that it was difficult at times to find instructional support services (such as tutoring, lab assistance) for these uniquely focused topics. Because this was a new program to the college, coupled with the nuances of the nuclear topics much like other areas of this program, the speed to which this program was developed did not lend itself to establish a strong foundation for support services. A key success not part of this study, was the adaptation of student led study groups.

The research discovered that the energy graduates either employed in the field or not, felt positively toward the instructional lecture and lab facilities, instructional equipment, and instructional materials topics. Students felt that the instructional equipment was satisfactory for program use in regard to being up to date, of sufficient quantity, and safe to use; a good number of students felt that the instructional materials were satisfactory for program use in regard to being conveniently located, current, and available at a reasonable cost. Typical of the college student, “available at a reasonable cost” had the most negative response.

Although many of the students were unhappy with the fact they did not attain a position in the energy field, over 80% of the students felt that they had the appropriate soft skills to work in the energy field. The research discovered that students overwhelmingly felt they attained such skills as they can successfully: demonstrate safe work habits, work in teams, work independently, solve complex problems, document clearly and effectively, and communicate clearly and effectively. This is clearly a positive finding uncovered by
the research as each of these skill sets have been listed as quite important through interviews by the employers.

Speaking to the Nuclear Uniform Curriculum Program (NUCP) core fundamentals, it was discovered that students felt most prepared in the area of “properties of reactor plant materials,” but when it came to “computers (plant specific)” they felt less equipped. A positive note that can be relayed to the students that was revealed by the study is that employers thought highly of the students’ computer skills. It can be assumed that the employers and graduates did not comprehend the survey question in regard to “plant specific” the same way, as there was little computer work done in the curriculum linked to energy production.

To summarize research question three, from the viewpoint of the program’s graduates, students felt they were adequately prepared for employment. However it should be noted that the study uncovered opinions that varied on several topics based on whether or not the students were employed in the energy industry. For example, almost 90% of those employed in the energy field felt they were overall prepared compared to 56% of those not employed in the industry. The largest amount of feedback in the additional comments was undoubtedly the frustration some students felt regarding the lack of employment opportunities. Several students made comments regarding the inability to get a job at the local plants because they neither had a family member that worked at the plant that would help them get a job or they did not have previous time in the Navy. In terms of adding to the research, surveying the graduates fills a present gap in the research literature, as this is the first known NUCP program evaluation collecting data from all major stakeholder groups.
Strengths and Limitations of the Present Study

One of the strengths of this study was that the researcher has been a part of the program since its inception and has been involved in nearly every key milestone regarding the program. Being familiar with all parties involved along with the history of the program allowed for a richer experience. In order to mitigate the researchers’ potential lack of objectivity regarding the participants and the material, a bracketing technique was used to organize the data as to not impede the perceptions at the heart of the study. An additional strength of the study was the history of the program itself. The program is still relatively new in its life cycle so going into it, the researcher was well aware that the experiences of the participants in the study would still be moderately fresh.

Although a perceived strength of the study is considered to be the recent perceptions, history was also a limitation to the study as the program has a relatively short life so far. Due to the low number of student respondents, it cannot be claimed that the differences are statistically significant between those who had energy jobs and those who did not. Also, because the program only surveyed graduates, not all students who took classes at the college and attained positions in the energy field were part of the study. Not all technical positions require associates degrees, so surveying these students could have potentially strengthened the data set. Typical for a case study, other limitations of the study included:

1. The study is limited due to the low number of interviewees that responded to the study.
2. The study is limited because the population size is small due to the sample being limited to small region,
3. The study is limited because the results and conclusions cannot be generalized to other programs.

**Recommendations for Future Research**

In the course of this project, numerous concepts have emerged in the findings that are recommended for future research, or a more comprehensive review of the findings developed for this project. The areas of further research include the following.

The first recommendation is to replicate this study to include participants at multiple power plants. There are presently 34 NUCP participating schools across the country. This would allow for comparison data to be used by the nuclear oversight committees allowing them to gage the perceptions of programming currently provided by community colleges. The additional data could provide valuable feedback regarding the implementation of the NUCP curriculum.

The second recommendation is to replicate the study to include all students that have taken classes in the Energy program that have attained a position in the energy field. Because only program graduates were surveyed in this study, there were data opportunities missed which would have increased the sample size substantially.

The final recommendation is to assess the success of mock entrance examination testing. There is not presently any research that evaluates how studying with a practice test helps students be successful on passing the entrance examination tests. It may be effective to include this process in the curriculum and implement at other community colleges which would likely increase the students’ pass rate.
Implications for Educational Leadership and Core Technical Education

The decision to start the Energy Production Technology program at the college and have it operational in less than six months was centered on keen intuition. The development of the program was based on an instinct from the college’s leadership group who had a vision and desperately needed a win because of low enrollment in the technical program areas. In order to get a sense of the leadership implication involving this study, it is important to articulate the decision-making behind how the program was born. It is equally important to discuss potential implications for community colleges when developing new NUCP programs and how this study affects policy and practice in career and technical education (CTE).

Amongst those in the know, the decision to start the development of the EPT program was ignited by a single phone call. Because there was a shortage of mechanical maintenance workers at Plant A, the college had been working with them for several months (late 2007) to develop a screening and recruiting plan. In January 2008, the Occupational Dean at the college received “the phone call,” from the Operations Training Supervisor at Plant B, about the possibility of developing a training program because his company had a need for entry-level skilled employees. This call fostered the concept of bringing both Plant B and Plant A Nuclear plant to start a joint program. The phone call could not have come at a better time for the college as two of the school’s technical staff had recently been terminated due to low program enrollment and the college had put its technical building up for sale.

After some early conversations with both plants, key individuals were contacted to participate in an advisory committee, and the development of the program had begun.
By the fall of 2008, the college had nearly 70 students enrolled. Burns (1978) stated that, “transformational leadership occurs when one or more persons engage with others in such a way that leaders and followers raise one another to higher levels of motivation and morality” (p. 20). According to the data provided by the advisory committee, in terms of motivation, they had to make some decisions that aligned with Burns’s definition of transformational leadership and they did it quickly.

“We make decisions based on what we think we know” (Sinek, 2009, p. 11). Sinek also stated that, “Every instruction we give, every course of action we set, a result we desire, starts with the same thing: a decision” (p. 15). Sinek contends that, “while some of us just wing it, most of us try to at least gather some data so we can make an educated decision” (p. 12). Simple logic suggests that to ensure the best results, more information and data are the key. Contrary to this, information from this study suggests that, often times, because of the present high unemployment rate and pressures from local leaders to help train for new jobs, this advisory committee, who prior to this process had collectively never met and were developing a program very few schools had done before, sometimes had to wing it.

Early on there was no real tangible data gathered other than the power plants reporting that potential retirements could leave them needing 300-500 potential employees over the course of the next five years. According to corporate training executives Dotlich, Cairo, and Rhinesmith (2006) in their book, *Head, Heart, and Guts*, they discuss the qualifications flourishing leaders must exhibit today: developing strategies, creating trust, and taking risks—all simultaneously. Based on a review of the findings, it was these three traits that led to the successful development of the energy
program. For example, this advisory committee, where all members were new to each other, had to put processes together, develop timelines and follow not only the guidelines established by the NUCP but the college’s procedures as well. Each advisory meeting established action items that needed to be completed and because of the stringent timelines, the group through each member’s collective competency had to trust each other that their items would be accomplished. There was a great risk that if the committee did not gel properly, potentially deadlines would be missed and the development process would be inefficient.

In terms of potential implications for community colleges when developing new NUCP programs, a big adjustment for colleges based on this study is the gap analysis and subsequent course development that is necessary for schools to align curriculum with standards established by the NEI coupled with understanding the employment needs of the region. For example, the college created and developed 25 new courses to align with the four separate degree concentrations. When it was later determined that the college would not need all four concentrations, the number of courses developed would have been considerably less as the college would have had a truer balance between the supply and the demand for specific occupations, therefore the community college leadership must insist on a realistic assessment of the labor need before program development begins.

This study affects policy and practice in career and technical education (CTE) by continuing to support the current practice of linking CTE education to third-party certified curriculum. In order to receive, Perkins grant funds, the Carl D. Perkins Career and Technical Education Act of 2006 require that CTE programs are aligned if possible
with third-party assessments, in this case the NUCP standards. The study also demonstrated what the literature says are important expectations from an advisory committee to an occupational program, and also speaks to how prospective programs should have a thorough needs analysis, and periodic program evaluation including a survey of graduates.

Through the study of the EPT program, key leadership attributes came to the forefront. Because the development of the program had to happen so quickly and collaboratively, the many hours that each advisory committee member donated to the process, whether it be curriculum development, recruiting students, teaching classes, or developing equipment lists, this group defined the relationship building in transformational leadership and the exchange that takes place in transactional leadership.

The process of reflection and summary of the key events listed by the advisory committee for this study, made it clear that it is very important for leaders to rely on their instincts as these individuals had to make quick decisions with limited data but trusted that they were going in the right direction.

Chapter V Conclusion

This study was initiated to find out how the EPT program at one Midwest community college successfully prepared graduates for a career in the energy industry.

From the viewpoint of the business and industry advisory committee created to oversee the Energy Production Technology degree program, the program was successful for creating a worker pipeline although it was concluded that it is necessary to make sure to understand the market, understand the culture, and get the key players involved for decision making.
From the viewpoint of the power plant employer, they believed that Energy Production Technology program graduates were adequately prepared for employment. Although it is difficult to align a community college program with that of a navy nuclear program in terms of overall nuclear awareness, an adjustment that can be made is for the college and plant to continually provide field experience and job shadowing opportunities to help them strengthen their nuclear awareness. Also, creating a stronger feedback loop within the program oversight process will help the college and plant to continue a robust relationship.

From the viewpoint of the program’s graduates, students felt they were adequately prepared for employment. Although it is unfortunate that some of the energy graduates were not immediately able to attain a job in the energy field for whatever possible reason and, had to eventually look elsewhere for gainful employment, this study demonstrated the importance of balancing the supply with the demand. This case study of a community college working with local industry to develop a new technical program validated that the process requires a clear vision, flexible leadership, and continuous feedback from all stakeholders.
REFERENCES


Light, J. (1982). A practitioner’s guide to using and meeting with advisory groups. Columbus, OH: Ohio State University, National Center for Research in Vocational Education.


Melendez (Ed.), *Communities and workforce development* (pp. 293-322). Kalamazoo, MI: W. E. Upjohn Institute for Employment Research.


Appendix A

Advisory Committee Interview Script
Interview Script for Energy Production Technology (EPT) Advisory Committee

Date:
Place:
Interviewer:
Interviewee:
Position of Interviewee:

Thank you for consenting to participate in this study. I would like to record this interview so that I can be as accurate as possible for the study. At any point during the course of the interview, you may ask that I turn the tape recorder off.

Interview questions (audio recording begins):

From your perspective as an EPT program advisory committee member at [Name of College]:

1. First and foremost, what led you to believe that it was important to be a part of an EPT program at the local community college?

2. Please tell me the story of your experience as an advisory committee member working with the EPT program. What has it been like for you and what it has meant to you?

3. Please describe how you feel the program’s feedback loop has progressed between the college stakeholders and the advisory committee in regards to maintaining successful program outcomes as required by Nuclear Uniform Curriculum Program (NUCP).
   a. Where has the feedback loop been most effective in regards to maintaining successful program outcomes?
   b. Where has feedback loop been ineffective in regards to maintaining successful program outcomes?

4. Please describe the impact you feel the development of the EPT program has made on establishing a worker pipeline?
   a. What concentrations have been most impactful and why?
   b. Where do you think gaps still exist?

5. In regards to key lessons learned, what advice would you provide to another community college or college that may look to develop a comparable program?

6. Looking back at your experiences as an advisory committee member, what stands out as significant from your perspective?

Thank you for participating in this interview. May I contact you for follow-up interviews or to clarify some of your responses?
Appendix B

Employer Interview Script/Checklist
Interview Script for Energy Production Technology (EPT) Employers

Date: 
Place: 
Interviewer: 
Interviewee: 
Position of Interviewee: 

Thank you for consenting to participate in this study. I would like to record this interview so that I can be as accurate as possible for the study. At any point during the course of the interview, you may ask that I turn the tape recorder off.

Interview questions (audio recording begins):

From your perspective as an employer of one or more graduates from the EPT program:

1. Do you feel the Energy Production Technology Program prepared students for a career in the Energy industry? Why or why not?

2. How do Energy Production Technology graduates from the college compare to those graduates from other technical programs (military, other colleges)?

3. Please explain what key job skills you feel students from the EPT program were BEST equipped with.

4. Please explain what key job skills you feel students from the EPT program were LEAST equipped with.

5. What additional advice would you provide to the college to further strengthen the program?

6. Could you now take a few minutes to complete this checklist survey as to the specific skills you have observed of the EPT graduates you have hired, especially when they were initially hired.

Thank you for participating in this interview. May I contact you for follow-up interviews or to clarify some of your responses?
# Energy Production Technology Program Review Survey: Employer Perceptions

1. Overall, the program prepared the graduates you hired for the following job skills:

<table>
<thead>
<tr>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. successfully demonstrate safe work habits.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. successfully work in teams.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. successfully work independently.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. successfully solve complex problems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. document clearly and effectively.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F. communicate clearly and effectively.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Overall, the program successfully prepared the graduates with the following NUCP core fundamentals:

<table>
<thead>
<tr>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Mathematics- Successfully explain and use mathematical concepts, scientific notation, dimensional analysis, algebra, geometry, trigonometry, graphs, and control charts, with an understanding of basic statistics (statistical concepts applications).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Physics- Successfully explain and use physics terms, units, mechanical principles, simple machines, definitions, and basic concepts.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Electrical Sciences- Successfully explain and apply the basic concepts of electrical fundamentals and electronics.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. Basic Atomic and Nuclear Physics- Successfully explain and apply basic concepts associated with atomic structure, nuclear interactions and reactions, fusion process, and reactor operation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Energy Production Technology Program Review Survey: Employer Perceptions**

<table>
<thead>
<tr>
<th>E. Heat Transfer and Fluid Flow-Successfully explain and apply basic concepts of thermodynamics, heat transfer, and principles of fluid flow.</th>
<th>Disagree</th>
<th>Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Agree</th>
<th>Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>F. Chemistry- Successfully Explain and apply the basic concepts of chemistry fundamentals, including water chemistry, control and reactor water chemistry.</td>
<td>Disagree</td>
<td>Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Agree</td>
<td>Agree</td>
</tr>
<tr>
<td>G. Properties of Reactor Plant Materials- Successfully explain the basic concepts of the properties of metals and alloys: the strength of materials; brittle fracture; plant material problems; thermal shock stress; erosion, corrosion, and control.</td>
<td>Disagree</td>
<td>Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Agree</td>
<td>Agree</td>
</tr>
<tr>
<td>H. Radiation Detection and Protection- Successfully explain the principles of radiation detection and monitoring and the effects of radiation on matter, including body tissue. Perform calculations involving time, distance, shielding, and dose rates.</td>
<td>Disagree</td>
<td>Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Agree</td>
<td>Agree</td>
</tr>
<tr>
<td>I. Reactor Plant Protection and Safety- Successfully explain reactor plant protection concepts, design basis accidents, transient prevention, and core damage mitigation.</td>
<td>Disagree</td>
<td>Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Agree</td>
<td>Agree</td>
</tr>
<tr>
<td>J. Computers (plant specific)- Successfully explain and perform basic computer operations.</td>
<td>Disagree</td>
<td>Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Agree</td>
<td>Agree</td>
</tr>
<tr>
<td>L. Basic Systems Knowledge- Successfully describe general systems and components associated with a nuclear power plant.</td>
<td>Disagree</td>
<td>Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Agree</td>
<td>Agree</td>
</tr>
<tr>
<td>M. Basic Components Knowledge- Successfully describe basic construction, application, and operation of basic power plant components.</td>
<td>Disagree</td>
<td>Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Agree</td>
<td>Agree</td>
</tr>
</tbody>
</table>

3. Overall, the Energy Production Technology program has:

<table>
<thead>
<tr>
<th>Disagree</th>
<th>Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Agree</th>
<th>Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>successfully prepared the graduates I have hired for a career in the energy industry.</td>
<td>Disagree</td>
<td>Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Agree</td>
</tr>
</tbody>
</table>
Appendix C

Student Survey
<table>
<thead>
<tr>
<th>Energy Production Technology Program Review Survey: STUDENT Perceptions</th>
</tr>
</thead>
</table>

1. Are you currently employed in the Energy industry?
   - Yes
   - No

2. The instructional content and quality of this program were:
   - Strongly Disagree
   - Moderately Disagree
   - Slightly Disagree
   - Slightly Agree
   - Moderately Agree
   - Strongly Agree

   designed to provide me with strong practical job application experience.

3. The teaching methods, procedures, and course content of this program:
   - Strongly Disagree
   - Moderately Disagree
   - Slightly Disagree
   - Slightly Agree
   - Moderately Agree
   - Strongly Agree

   A. were very pertinent to my major.
   - 
   B. were very current and meaningful to me.

4. The related and support courses were:
   - Strongly Disagree
   - Moderately Disagree
   - Slightly Disagree
   - Slightly Agree
   - Moderately Agree
   - Strongly Agree

   A. very pertinent to my major.
   - 
   B. very current and meaningful to me.
5. The work experience aspect of the program was:

<table>
<thead>
<tr>
<th></th>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. readily available at convenient locations.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. readily available at convenient times of day.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. strongly coordinated with classroom instruction.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. strongly coordinated with the employer supervisor.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. The career planning information provided by the college:

<table>
<thead>
<tr>
<th></th>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. successfully met my needs and interests.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. successfully helped me plan my program.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. successfully helped me make career decisions and choices.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. successfully helped me understand my rights and responsibilities as an employee.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. successfully helped me evaluate job opportunities in relation to salary, benefits and conditions of employment.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F. was provided by very knowledgeable, interested staff.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G. clearly explained non-traditional occupational opportunities to me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7. The job success information on former graduates from this program:

<table>
<thead>
<tr>
<th></th>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. successfully helped me make career decisions.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. clearly conveyed job opportunities available via this occupation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. clearly identified where these job opportunities were located.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. clearly told me about job advancement opportunities.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. The placement services at this college:

<table>
<thead>
<tr>
<th></th>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. successfully helped me find employment opportunities.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. prepared me well to apply for a job.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. The occupational instructors teaching in this program:

<table>
<thead>
<tr>
<th></th>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. knew the subject matter and occupational requirements well.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. were always available to provide help when I needed it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. always provided instruction so it was interesting and understandable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
10. Instructional support services (such as tutoring, lab assistance) at this college were:

<table>
<thead>
<tr>
<th></th>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. always available to meet my needs and interests.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. always provided by knowledgeable, interested staff</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11. The instructional lecture and laboratory facilities:

<table>
<thead>
<tr>
<th></th>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. always provided adequate lighting, ventilation, heating, power and other utilities.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. always included enough work stations for the number of students enrolled.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. were always safe, functional, and well maintained.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. were always available on an equal basis for all students.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. The instructional equipment was:

<table>
<thead>
<tr>
<th></th>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. always current and representative of the industry.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. always in sufficient quantity to avoid long delays in use.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. always safe and in good condition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
13. The instructional materials (e.g. textbooks, reference books, supplies) were:

<table>
<thead>
<tr>
<th></th>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. always available and conveniently located for use as needed</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>B. always current and meaningful to the subject</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>C. always available at a reasonable cost</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

14. Overall, the program prepared me for the following job skills:

<table>
<thead>
<tr>
<th></th>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. successfully demonstrate safe work habits</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>B. successfully work in teams</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>C. successfully work independently</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>D. successfully solve complex problems</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>E. document clearly and effectively</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>F. communicate clearly and effectively</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

15. Overall, the program prepared me to meet the following Nuclear Uniform Curriculum Program (NUCP) core fundamentals:

<table>
<thead>
<tr>
<th></th>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Mathematics - Successfully explain and use mathematical concepts, scientific notation, dimensional analysis, algebra, geometry, trigonometry, graphs, and control charts, with an understanding of basic statistics (statistical concepts applications)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
B. Physics- Successfully explain and use physics terms, units, mechanical principles, simple machines, definitions, and basic concepts.

<table>
<thead>
<tr>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
</table>

C. Electrical Sciences- Successfully explain and apply the basic concepts of electrical fundamentals and electronics.

<table>
<thead>
<tr>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
</table>

D. Basic Atomic and Nuclear Physics- Successfully explain and apply basic concepts associated with atomic structure, nuclear interactions and reactions, fission process, and reactor operation.

<table>
<thead>
<tr>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
</table>

E. Heat Transfer and Fluid Flow- Successfully explain and apply basic concepts of thermodynamics, heat transfer, and principles of fluid flow.

<table>
<thead>
<tr>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
</table>

F. Chemistry- Successfully explain and apply the basic concepts of chemistry fundamentals, including water chemistry control and reactor water chemistry.

<table>
<thead>
<tr>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
</table>

G. Properties of Reactor Plant Materials- Successfully explain the basic concepts of the properties of metals and alloys; the strength of materials; brittle fracture; plant material problems; thermal shock stress; erosion, corrosion, and control.

<table>
<thead>
<tr>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>H. Radiation Detection and Protection</strong>&lt;br&gt;Successfully explain the principles of radiation detection and monitors and the effects of radiation on matter, including body tissue. Perform calculations involving time, distance, shielding, and dose rate.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>I. Reactor Plant Protection and Safety</strong>&lt;br&gt;Successfully explain reactor plant protection concepts, design basis accidents, transient prevention, and core damage mitigation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>J. Computers (plant specific)</strong>&lt;br&gt;Successfully explain and perform basic computer operations.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>L. Basic Systems Knowledge</strong>&lt;br&gt;Successfully describe general systems and components associated with a nuclear power plant.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>M. Basic Components Knowledge</strong>&lt;br&gt;Successfully describe basic construction, application, and operation of basic power plant components.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

16. **Overall the Energy Production Technology Program:**

<table>
<thead>
<tr>
<th></th>
<th>Disagree Strongly</th>
<th>Disagree Moderately</th>
<th>Disagree Slightly</th>
<th>Agree Slightly</th>
<th>Agree Moderately</th>
<th>Agree Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. successfully prepared me well for a career in the energy industry.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
17. For what areas did you feel you were BEST prepared?

18. For what areas did you feel you were LEAST prepared?

19. Additional comments or suggestions for the program.
Appendix D

HSIRB Approval
Date: June 17, 2015

To: Richard Zinser, Principal Investigator
    Kenneth Flowers, Student Investigator for dissertation

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number 15-06-13

This letter will serve as confirmation that your research project titled “A Midwest Community College and the Highly Regulated Power Production Industry: A Case Study Regarding the Development of an Energy Production Technology Program” has been approved under the expedited category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may only be conducted exactly in the form it was approved. You must seek specific board approval for any changes in this project (e.g., you must request a post approval change to enroll subjects beyond the number stated in your application under “Number of subjects you want to complete the study”). Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

Reapproval of the project is required if it extends beyond the termination date stated below.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: June 16, 2016