AN ABSTRACT OF THE DISSERTATION OF

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Professional development is a critical part of education, especially in career and technical education (CTE). CTE programs have rapidly changing technological foundations, and while the CTE teachers' primary focus is to prepare students for entry-level positions in their occupational areas, CTE teachers are also required to embed academics into their curriculum as well. The purpose of this census study was to determine the perceived professional development needs of secondary Oregon industrial and engineering (I & E) teachers (N=193) during the 2013-2014 school year; 112 responded for a return rate of 58%.

This study revealed that Oregon's I & E workforce is older than in other content areas in the state, with over half of the respondents over 50 years old and nearing retirement. This study revealed a difference in priorities of the perceived CTE professional development needs between federal and state leaders with those who work in the field. Grant writing and funding opportunities, motivating students to learn, and developing curriculum-based school-to-work and school-to-career activities were the top three professional development needs identified by respondents. This study also found that the sustainability of programs was a major concern for professional development by the respondents.

Oregon Industrial and Engineering Teachers'
Perceived Professional Development Needs

by

Dale E. Moon

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Major Professor, representing Education

_____

Dean of the College of Education

_____

Dean of the Graduate School

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

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Dale E. Moon, Author

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"All is by my side" – Jimi Hendrix

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DEDICATION

I dedicate this dissertation to the memory of my mother and father for their constant, unconditional love, support, and encouragement. They would have been happy to see me complete my dissertation and follow in my father's steps as a teacher educator.

Chapter One: Introduction

Nationwide, career and technical education (CTE) programs are changing, evolving and innovating to better serve the country's needs. CTE is preparing students of all ages to help drive America's success and vitality. Further, it is creating an educational environment that integrates core academics with real-world relevance. CTE is leading this change, transforming expectations, and making a difference for students, for secondary and postsecondary schools, for businesses and industry, and for America (NASDCTEc, 2014).

CTE, formerly called vocational education, provides students of all ages with the academic and technical skills, knowledge, and training necessary to succeed in future careers and to become lifelong learners. CTE prepares these learners for the world of work by introducing them to workplace competencies, and makes academic content accessible to students by providing instruction in a hands-on context. According to the Association for Career and Technical Education (2013), CTE provides real-world relevance to academic content; offers students employability skills; includes career pathways, linking secondary and postsecondary education and training; and provides workplace training, skills upgrades, and career advancement opportunities. Essential to CTE are rigorous program standards (ACTE, 2013). The Carl D. Perkins Career and Technical Education Act of 2006 (Perkins IV) calls upon states to create sequences of academic and CTE coursework to help students attain a postsecondary degree or industry-recognized certificate or credential, otherwise known as programs of study.

At a minimum, according to the definition put forward in Perkins IV, programs of study must:

> Incorporate and align secondary and postsecondary education elements. Alignment requires secondary and postsecondary faculty to agree about the content most appropriate to be delivered at each level and the ways in which secondary students will demonstrate the acquisition of knowledge and skills sufficient to receive postsecondary credit. This requires faculty from both levels to take the time to construct meaningful course sequences that each will be trusted to deliver.
> Include coherent and rigorous content aligned with challenging academic standards and relevant career and technical content in a coordinated, nonduplicative progression of courses. The integration of technical and academic content requires time for teachers of academic and technical courses to work together to identify the knowledge and skills appropriate for instruction in their respective classes.
> May include the opportunity for dual- or concurrent-enrollment programs. Scheduling, costs, and teacher qualifications represent barriers to offering courses that award postsecondary credit at the high school level.
> Lead to an industry-recognized credential or certificate at the postsecondary level or an associate or baccalaureate degree. Schools recognize the value of industry certification in improving instruction and signaling that students have acquired a defined set of skills and knowledge. Programs that earn industry certification receive high-quality curriculum and professional development opportunities for their instructors (Brustein, 2006, p. 39).

A successful program of study (POS) require a lot of hard work from a range of stakeholders. It is relatively easy to design a program of study that shows the academic and technical courses to be taken at the secondary and postsecondary levels; the harder work lies in actually integrating and articulating these courses. This requires extensive interaction, negotiation, and collaboration over time with secondary, postsecondary, and local business partners.

Oregon's economic health is fundamentally linked to the availability of a skilled workforce. While many companies provide on-the-job training for their workers specific to their industry, Oregon needs workers who are prepared coming out of high school with the basic skills

necessary to excel. Not every student will go to college, and one of the best ways to strengthen Oregon's workforce is through CTE programs.

CTE teachers are challenged to prepare their students for increasingly rigorous workplace standards, apprenticeships and further study at two-and four-year colleges. "The challenge of providing quality professional development for teachers has a long history, particularly in disciplines where the content knowledge and pedagogy are changing rapidly" (De Miranda, Troxell, Siller & Iversen, 2008, p. 146). This becomes even more critical now that Perkins IV links funding to student outcomes. Students must now demonstrate proficiency on technical assessments that cover industry-recognized standards.

Professional development (PD) is a critical part of education, especially in CTE. CTE programs have rapidly changing technological foundations (National Research Center for Career and Technical Education, 2010). The CTE teachers' primary focus is to prepare students for entry-level positions in their occupational areas, and as a result, CTE teachers must ensure their own technical knowledge and skills remain current in order to adequately prepare students for these technically enhanced work environments.

Drage (2010) stated that the most serious unsolved problem for policy and practice in American education today is the professional development of K-12 teachers. CTE professional development becomes especially important during the first few years of teaching (Joerger, 2002; Joerger & Bremer, 2001) but is also necessary throughout a teacher's career (Roberts & Dyer, 2004). The professional development of secondary CTE teachers is particularly important as it addresses content areas that continuously evolve and advance (Fletcher, 2006; Joerger, 2002; Medrich, 2005; Rojewski, 2002). Joerger (2002) emphasized the need for appropriate and timely

pre-service and in-service activities for CTE teachers in order to ensure they are properly equipped to contend with changing conditions in CTE education.

Professional development for teachers is often designed to be delivered to diverse groups in the most economical way, with little regard for what the CTE teacher really needs or wants (Sturko & Gregson, 2009). Often, professional development is a program of activities, lectures or workshops undertaken by groups of teachers from many different content areas at the beginning of the school year, or at some other predetermined time during the school year. Professional development programs are usually a one-off workshop or an isolated professional development day based on limited conditions for teacher learning (Hoban, 2002). Many CTE teachers express dissatisfaction with these types of professional development opportunities made available to them, and insist that the most effective professional development programs are self-initiated (National Research Council, 2006; Sturko & Gregson, 2009).

While CTE teachers may appear to be resistant to current professional development offerings, they need professional development that assists in their learning, builds collaboration skills, and includes strategies to help them integrate academic skills into their curricula, especially given the requirements set forth in Perkins IV. Lambeth, Elliot, and Joerger (2008) acknowledged that professional development of teachers is an important aspect of the national CTE research agenda. Ruhland and Bremer (2003b) concluded that additional research is warranted on the relationship between traditionally trained and alternatively prepared CTE teachers. Wilson et al. (2001) called for more research that is designed to tease out similarities and differences to examine both content and quality, and at differences across subject matter, while Briggs (2008) stated that more research is needed for professional development models in CTE.

Knowles (1980) stated that the adult learner is likely to disengage from those learning activities for which there is no perceived need. CTE teachers need to understand the relevance of the content before they will engage in the learning process. The first task of the professional development facilitator is to help the learners become aware of the "need to know." Borich (1980) stated that in order to conduct meaningful professional development opportunities, training institutions must possess a method in which to improve their training. Borich developed the needs assessment model to accomplish the task of determining the training needs of teachers. Needs assessment is a process for identifying gaps in results and arranging them in priority order for resolution (ACTE, 2013). The Borich Needs Assessment Model uses mean weighted discrepancy scores to determine the level of priority as reported by the teachers' perceived level of importance and perceived level of attainment (Borich, 1980). Borich defined a training need as "a discrepancy between and educational goal and trainee performance in relation to this goal" (p. 39). By addressing discrepancies as *what is* and *what should be*, training needs can be better understood. Borich defined *what is* as measured behaviors, skills and competencies, and *what should be* is defined as the overall goals of the training program (Borich, 1980).

Focus of the Study

The purpose of this quantitative descriptive study was to describe Oregon industrial and engineering systems (I & E) teachers' perceptions of their professional development needs. The following questions guided this study:

1. What are Oregon I & E teachers' perceived importance of specific areas of their professional development?

2. What are Oregon I & E teachers' perceived competence in specific areas of professional development?

3. What are the perceived professional development needs of Oregon I & E teachers?

Significance of the Study

In Oregon, I & E encompasses automotive and heavy equipment technology, construction, engineering, information and communications technology, manufacturing, and transportation. Oregon I & E teachers are expected not only to be content specialists, but must also prepare their students in the attainment of rigorous core knowledge and skills needed for success in high skilled, high wage jobs and postsecondary education (ACTE,   2006; Oregon Department of Education, 2014). To be successful in preparing their students for careers or postsecondary education, I & E teachers must help students understand the relevance of their academic studies by incorporating related academic content into the CTE classroom.

Oregon teachers are required to participate in professional development in order to renew their licenses. There are numerous professional development opportunities available to CTE teachers during the school year and many of them satisfy the current Oregon requirement of professional development units (PDUs) for licensure renewal credit. PDUs can be earned by attending an approved professional development activity or by taking college credit classes. One hour of approved professional development activity equals one PDU. One semester hour of college credit equals 30 PDUs, while one quarter hour of college credit equals 20 PDUs. Teachers must accumulate 75 PDUs for a three-year license, and 125 PDUs for a five-year license.   Despite the agreed upon importance of professional development for teachers, there is little research related to the identification and ranking of in-service needs of Oregon I & E CTE teachers.

This study serves as a snapshot of the thinking of I & E teachers toward professional development, and contributes to the understanding of strengths, weaknesses, and training needs

of I & E teachers in Oregon. This study also provides valuable information to those who develop I & E professional development activities as to what professional development I & E teachers need and find most useful.

Definition of Key Terms

Alternative certification (AC) – State-defined routes through which an individual who already has at least a bachelor's degree can obtain certification to teach without necessarily having to go back to college and complete a college, campus-based teacher education program (National Association of State Directors of Career Technical Education Consortium, 2009).

Approved CTE instructor –To teach in an Oregon state approved CTE program, the instructor must have an appropriate CTE license and/or endorsement specific to the program career area (Oregon Department of Education, 2014).

Approved programs of study – CTE programs of study are designed by secondary and postsecondary partners to be a series of complete, yet non-duplicative career focused courses. Programs of study emphasize technical, academic and career knowledge and skills acquired in applied career contexts. (Oregon Department of Education, 2014).

Career and technical education (CTE) – "Formerly known as vocational education, career and technical skills are the focus of the curriculum that is experientially based to demonstrate how education relates to the workplace and to life" (Bruening and Scanlon, 2001, p. 2).

Professional development – "The sum of formal and informal learning experiences throughout one's career from pre-service teacher education to retirement" (Fullan and Steigelbauer, 1991, p. 326).

Chapter Two: Literature Review

This study focused on current Oregon I & E teachers' perceptions of their professional development needs. While there is little information concerning I & E teachers in Oregon and their professional development needs, there is relevant national research that supports the three research questions that guided this research and the proposed methodology.

This chapter will review the current literature related to CTE and professional development. The first section will present the scope and purpose of CTE. The second section will explore general information concerning professional development and specific research regarding professional development for secondary CTE instructors. The third section will discuss the Borich Needs Assessment Model as a tool to determine the professional development needs of Oregon I & E instructors. The chapter concludes with the conceptual framework for the study.

Career and Technical Education (CTE)

Through funding, "Federal and state legislation has had more impact on the development of formal education in the United States than all the Rousseaus, Herbarts, and Deweys combined" (Nystrom & Bayne, 1979, p. 7). This critical federal support serves as a key element to meeting the needs of students, as well as our society (Threeton, 2007). CTE, formerly called vocational education and workforce development education, has been one component of high school curricula in the United States since the Smith-Hughes Act of 1917. Federal legislation continued to support CTE through the Vocational Education Act of 1963 and the Carl D. Perkins Act of 1984. Threeton (2007) stated that preparing students for a career and the inclusion of all students have been common threads throughout the existence of federal CTE legislation. Today, over 94% of all high school students in the United States take at least one CTE course during

their high school careers (ACTE, 2014). The average high school graduation rate for students concentrating in CTE programs is over 90%, compared to the national average freshman rate of just under 75%,. Additionally, more than 70% of secondary CTE students who earned one or more credits in a state-approved CTE program, of which at least one-half credit must be designated as a required course, pursued postsecondary education (ACTE, 2014).

CTE prepares students with mid-level job skills. These mid-level job skills "…are those that generally require some significant education and training beyond high school but less than a bachelor's degree" (Holzer & Lerman, 2009, p. 1). The need for these job skills is not projected to decrease. About 45% of new jobs between 2004 and 2014 will be in occupations that require mid-level skills (Holzer & Lerman, 2009). Holzer and Lerman stated pay increases for mid-level jobs are proportionate to bachelor degree positions. They also report many mid-level jobs have seen sharp increases in annual pay, including many from the health science area. Holzer and Lerman argue "…researchers are underestimating mid-level job skill prospects in the labor market and policy makers are paying too little attention to strengthening skills development for these positions" (p. 1). Camp and Heath-Camp (2007) and Twomey (2002) predicted CTE enrollment will increase and therefore more teachers will be needed in all CTE program areas. This appears to be not the case however. According to the National Center for Education Statistics (NCES), the overall average of CTE credits earned by a high school graduates declined between 1990 and 2009 while course taking in areas such as health care and communications have increased (N. National Center for Education Statistics, 2012). NCES also reports that during this same time period, the average number of credits earned in academic courses rose from 16.7 in 1990 to 20.0 in 2009 (National Center for Education Information, 2009).

CTE teachers have unique instructional needs and challenges in training students for mid-level technical careers. Most CTE programs are primarily hands-on courses and require teachers to understand appropriate instructional strategies which go beyond traditional lecture methods. In order to teach the newest software or run the newest equipment, CTE teachers must update their skills regularly, a professional development challenge in itself (Twomey, 2002). CTE teachers train students on the use of potentially dangerous equipment such as construction tools, car lifts, kitchen knives, and farm equipment. In health occupations programs for example, after teaching proper techniques for bathing patients, taking vital signs and lifting patients, health occupations teachers may take their students into hospitals and long-term care facilities so they may practice their clinical skills on actual patients.

CTE teachers are also asked to sponsor career and technical student organizations (CTSO) such as Future Farmers of America, Skills USA, and Future Business Leaders of America. These CTSOs require meetings, student leadership conferences, and competitive events that generally take place after school hours. Typically, in an average sized high school, there is only one CTE teacher assigned to each content area. As these student organizations fall under the CTE teacher's specific program, and they are the only CTE teacher at the school familiar with the student organization, the responsibility cannot be shared with another teacher (Joerger & Bremer, 2001; Smith, 2007). CTE teachers in Oregon must have an advisory board, create close connections to local business and industry for the purpose of placing students in work-based opportunities and are responsible for curriculum development. Typically I & E instructors are responsible for maintaining their software and equipment as well. These types of activities require time and effort that exceeds those of a typical instructor.

CTE Teacher Licensure

Until recently, individuals who wanted to teach high school CTE courses entered a teacher education program at a college or university, completed a student teaching requirement during their senior year, and started teaching at the age of 22 or 23. Teachers were hired upon completion of a baccalaureate degree from an approved teacher education program (Ruhland & Bremer, 2003a).

Over the past two decades, the number of CTE teacher education programs in colleges and universities has declined (National Research Center for Career and Technical Education, 2010). Lynch (1990) identified 98 institutions offering teacher education programs in four or more traditional "vocational education" programs. Eleven years later there was a sharp decline, nearly 33%, in the number of teacher education programs preparing CTE teachers (Bruening et al., 2001). In an attempt to find more recent information on the status of CTE teacher preparation programs in colleges and universities, the National Research Center for Career and Technical Education (NRCCTE), concluded in 2010 that the Bruening et al. (2001) survey was the most recent data available. The NRCCTE (2010), based on the Lynch (1990) and Bruening et al. (2001) studies, reported that, "the number of CTE teacher education programs declined during the 1990's" (p. 26). From this decline, two distinctive types of CTE licensure models have emerged, the traditional four year baccalaureate model and the alternative preparation/certification model (Szuminski, 2003).

One major concern when discussing the preparation, licensure and professional development of secondary CTE teachers is the varying entry points and educational levels of new entrants into the profession. Bartlett (2002) reported that teachers make the decision to

enter the profession when they are in middle school, high school, during their college years, or even later. Many entered teaching due to job layoffs, retirement, or even job dissatisfaction (Bartlett, 2002; Ruhland & Bremer, 2003b).

In 1983, less than nine states permitted alternatives to college- and university-based teacher programs. By 1999, all 50 states offered some form of alternative certification (Boyd et. al., 2007; Feistritzer & Chester, 2000). Between 1985 and 1986, 275 teachers were certified through alternative routes, and between 2008 and 2009 an estimated 59,000 people had been certified to teach through alternative routes, an increase of 214.5% (Feistritzer et al., 2011). Ruhland and Bremer (2003) reported the percentage of alternatively certified CTE teachers to be about 28%. In a survey of 12,000 CTE teachers at High Schools That Work (HSTW) sites in 30 states, 75% of teachers reported entering through an alternative route (Bottoms & McNally, 2005). The HSTW is a nationwide school improvement initiative for high school leaders and teachers. More than 1,200 HSTW sites in 30 states currently use the framework of HSTW goals and key practices to raise student achievement and graduation rates. The National Association of State Directors of Career and Technical Education consortium members (NASDCTEc), (2010) reported that 48 states and the District of Columbia were implementing some type of alternative route to teacher licensure. In this report only Alaska and Oregon are identified as not having an alternative routes to teacher licensure. However, in Oregon, "Because a CTE license is not considered a 'full' state license the CTE licensing process is often not considered as an alternative licensure program. However, it is an alternative route to a CTE license and in the CTE world it is talked about as an alternative program" (J. Ives, personal communication, March 12, 2014).

The majority of CTE programs such as business education, technology education, agriculture education, family and consumer sciences, and marketing/distribution education still use the traditional four-year baccalaureate model similarly used by elementary, middle, and high school teachers. Although most of these teachers do have some occupational experience, in most states it is not a requirement for teacher licensure (Gray & Walter, 2001). I & E programs typically use an alternative preparation/certification (AC) model that stresses work experience over educational degrees. Gray and Walter reported that I & E teachers, "typically have at least an associate degree, and twice as much work experience related to their teaching assignment (15 years) as other vocational teachers (8 years) and three times as much as academic teachers (6 years)" (p. 3). While student enrollment in CTE courses has increased, fewer CTE teachers are graduating from teacher education programs (DeWitt, 2010; NASDCTE c, 2010). Secondary schools have responded by recruiting more teachers directly from business and industry.

While much of the discussion around teacher recruitment and retention has been tied to "core academic" teachers as discussed in the No Child Left Behind Act of 2001 (NCLB), it is also critical to have high quality traditional teacher preparation and alternative certification programs available for CTE teachers (Szuminski, 2002; Twomey, 2002). These alternative routes into the teaching profession are becoming more and more attractive to policymakers and teacher-educators as strategies for recruiting potential teachers from industry and tackling teacher shortages (Camp & Heath - Camp, 2007; Szuminski, 2003).

There is a process for a person coming directly from industry into an approved I & E program in Oregon. An instructional appraisal committee (IAC) is formed to evaluate the candidate's strengths and weaknesses in regards to their content knowledge. This committee is made up of five-to-seven members, representing employers or employees from local business or

industry related to the applicant's CTE program area, secondary/postsecondary instructors or administrators in a CTE program related to the endorsement area of the applicant, a local district administrator, and the regional coordinator. Should the IAC make the recommendation that the applicant receive their CTE I license, a three year professional development plan is developed which includes how the applicant will obtain a minimum of 18 quarter hours or 12 semester hours of teacher preparation courses. The new teacher will need a total of three of the following courses: (either three quarter hours each or two semester hours),

a) classroom management,

b) multicultural education,

c) introduction to CTE in Oregon,

d) second language acquisition,

e) introduction to the education profession,

f) human development for adolescents,

g) Oregon school law including a focus on special needs students, and

h) education psychology and learning development.

Additionally, the new teacher needs one of the following courses:

a) curriculum design, or

b) instructional strategies and assessment.

The new teacher will also need both of the following courses:

a) instructional methodology – math

b) instructional methodology – reading, writing and literacy.

The new teacher will need to have completed a college level math course appropriate to the career area and a college level language arts course and they must pass the Basic Skills Test by the end of their first year teaching.

The IAC may increase the minimum requirements if they deem additional education is warranted. The IAC also assigns a trained mentor to work with the new teacher on instructional planning and preparation, classroom instruction, classroom management, assessment of student performance, and professional development. If the new teacher successfully completes their professional development plan in the allotted three years, the new teacher is granted a CTE II license which can be renewed every three years, indefinitely (Oregon Department of Education, 2013).

As previously stated, meeting the demand for qualified teachers is a challenge in all areas of education. Increasing secondary enrollment in CTE programs, the declining number and size of traditional CTE teacher preparation programs, and the growing number of teacher retirements has created a concern about the lack of supply of CTE teachers. What makes alternative certification attractive to some participants and their employers is some of the alternative certification programs allow the participant to teach while completing the program requirements, such as Oregon's CTE I license. This results in CTE teachers, with little or no teacher training, and with little or no prior classroom experience, teaching full time. The fundamental aspects of classroom management are presented to these teachers after they have already created a classroom routine, whereas traditionally prepared teachers have participated in an internship process, thus giving them valuable experiences before going into the classroom.

After teachers obtain full licensure, they continue to participate in professional development activities. The choice to participate in any future professional development may be

based upon their own professional goals or requirements to renew their permanent license. Participation in professional development is ongoing until retirement. "Regardless of the teacher certification route (i.e., traditional or alternative), the phases of pre-service, induction, and continuing professional development are important to achieving and maintaining teaching competence" (Ruhland & Bremer, 2003a, p. 2).

Professional Development of Career and Technical Teachers

The current federal policy for CTE reflects the belief that increasing teacher quality through effective preparation and professional development is important in improving the academic and technical achievement of CTE students (Stone, 2011). Perkins IV calls for professional development of CTE teachers to be high quality, sustained, intensive, and focused on instruction, which increases teachers' academic knowledge and understanding of industry standards (Brustein, 2006). Perkins IV pushes for improvement in teacher quality from NCLB and the recommendations of the National Assessment of Vocational Education that called for better teacher quality in CTE (Cramer, 2004; Silverberg, Warner, Fong, & Goodwin, 2004).

Professional development generally refers to ongoing learning opportunities available to teachers and other district employees, and is typically provided by local schools and school districts. Fullan and Steigelbauer (1991) defined professional development as the "sum of formal and informal learning experiences throughout one's career from pre-service teacher education to retirement" (p. 326). Effective professional development is seen as vital to school success and teacher satisfaction (Saucier, 2010). With many of today's educational institutions facing an array of complex challenges, from working with an increasingly diverse student population and integrating new technology in the classroom, to meeting rigorous academic standards and goals, observers have stressed the need for teachers to have the ability to enhance

and build on their instructional knowledge (National Commission on Teaching & America's Future, 1996, National Research Center for Career and Technical Education, 2010).

Numerous studies have been conducted concerning CTE teacher professional development, many of them focused on agriculture education (Duncan, Rickettes, Peake & Uesseler, 2006, Joerger, 2002; Camp, Park, & Moore, 2006; Lester, 2012; Findlay, 1992; Saucier, 2010). Joerger (2002) studied first year agricultural teachers in Minnesota and concluded that as a cohort, first-year agriculture teachers believed professional competencies are important for their success and survival, but the cohort was only "somewhat competent in performing the competencies, and that in-service education was warranted" (p. 21). Joerger also found first year agriculture teachers needed in-service education in the following areas: (a) establishment and use of advisory committees; (b) student management, guidance and motivation; (c) preparation of Future Farmers of America (FFA) degree and proficiency award applications; (d) creation of support organizations such as FFA Alumni; (e) integration of current agricultural technology into the curriculum, and; (f) approaches as to how to teach the relationship between agriculture and the environment.

In a study of Georgia agriculture teachers' perceived pre-service and in-service needs, Duncan et al. (2006) reported that teachers indicated they needed additional preparation in technical areas such as biotechnology, aquaculture, and veterinary technology. Joerger reported managing student behavior, developing an effective public relations program and advising students interested in post-secondary education were areas that teachers indicated a need for professional development. Lester (2012) also reported agriculture teachers had the highest need for professional development in safety, two stroke engines, renewable energy, and solar energy. Garton and Chung (1997) found Missouri's beginning agriculture science teachers needed

professional development in instruction, program planning, development, and evaluation, motivating students, FFA degree and proficiency programs, using advisory committees, and program administration.

Few studies have examined I & E teacher professional development. Cannon, Kitchel and Duncan (2012) studied the perceived professional development needs of Idaho secondary CTE teachers. In their descriptive study data were gathered using an online survey that was sent to all CTE teachers (N=725) employed in Idaho. Using the Borich Needs Assessment Model, teachers were asked to rate 35 items on two distinct Likert-type scales, perceived level of importance and perceived level of competence. Cannon et al. (2010) concluded "teaching students to think critically and creatively" and "motivating students to learn" were the highest rated professional development needs.

Ruhland and Bremer (2003b) examined the professional development needs of novice CTE teachers. Through telephone interviews they concluded that while most CTE teachers felt adequately prepared by their teacher preparation programs, areas which more preparation may have been helpful included classroom management and working with special populations. The CTE teachers in this study varied greatly in age, subject matter knowledge, and pedagogical skill. A main finding in this study was that, "Teachers who enter the teaching profession through alternative certification routes are more likely to feel well-prepared in terms of content, but felt less well-prepared in pedagogy than those who have completed traditional certification programs" (Ruhland & Bremer, 2002, p. 1). This may be due to the years of industry experience many of these alternatively certified teachers bring to the classroom.

Extensive studies have been done on the differences of alternatively and traditionally certified teachers and the pre-service and in-service training they need. Berdnarz et al. (2004)

asserted that a highly qualified teacher needs to have the following qualities: pedagogical knowledge, content knowledge, and practical professional knowledge. Ruhland and Bremer (2003a) studied traditionally and alternatively certified CTE teachers' perceptions of their first year of teaching. They found alternatively certified teachers were more likely to report they were better prepared in knowledge of subject matter while traditionally certified teachers were more likely to report they were better prepared in pedagogy. Bottoms and McNally (2005) identified classroom management, teaching strategies, and the lack of skills to address the needs of a diverse student population as key areas of knowledge that are lacking in alternatively certified teachers. Custer and Panagos (1996) advocate that CTE teachers are often not trained to teach students with disabilities. Heath-Camp and Camp (1990) and Smith (2003) viewed the lack of preparation before instructors are inserted into the classroom as an area of concern. Other areas of concern were curriculum development, lesson planning, CTSOs and orientation to the profession (Heath-Camp & Camp, 1990a; Heath-Camp & Camp, 1990b; Suell & Piotrowski, 2007). While most of the research appears to be centered on beginning teachers, there appears to be little research to describe I & E teachers' perceptions of their professional development needs.

Curriculum Implementation in the Academic Environment

Often the instruction of the curriculum by the instructor is limited by the resources allocated to the teacher and the constraints of the schools' learning environment (Knobloch, 2008). Lawrenz (1985) found teachers will not implement educational resources into their classes if they are not convinced of the value of the curriculum and do not understand how to use it. Often, the predetermined beliefs of teachers influence how they connect academic content in the classroom to real life applications (Knobloch, 2008).

Thompson (2001) found administrative support to be an important aspect of program development and expansion. Thompson also found that it is important for teachers to believe in the curriculum they teach. In a 2006 study of the implementation of mathematics concepts into horticulture classes, Jansen, Enochs, and Thompson (2006) determined that teachers' concerns contributed to the barriers of implementation of curriculum. They stated that the concerns of agriculture teachers, "may hinder the success of student learning" (p.51). The lack of educational reform may also relate to barriers that teachers encounter when attempting to integrate vocational and academic curriculum in the classroom (Roberson, Flowers, & Moore, 2000).

The beliefs that teachers have about the implementation of curriculum in educational environments are developed from various personal, professional, and environmental factors. These factors may include: personal beliefs about the curriculum or content area (Borko & Putnam, 1996; Moseley, Reinke, & Bookout, 2002; Pajares, 1992); teacher comfort level with the curriculum content (Knobloch, 2008); and the availability of time, instructional resources, and level of preparation regarding the content area (Thompson & Balschweid, 1999; Wilson, 1994). The perceived value of the subject matter (Lawrenz, 1985), teachers' past experience with the subject matter area (Thompson & Balschweid, 1999), classroom and laboratory teaching environment (Knoblock, 2008), and personal and professional motivation (Bandura, 1997; Tschannen-Moran, Woolfolk-Hoy, & Hoy, 1998) have also been found to influence teachers' decisions to implement curriculum. Methods of curriculum delivery, teacher self-efficacy, administrative pressure toward the curriculum, field experience of the teacher, and individual beliefs influence the implementation of curriculum into the classroom (Jansen et al., 2006).

Teachers teach what they know best (House, 1981). If teachers have little or no knowledge concerning curriculum content, they may be less likely to include those topics into the course. Darr (1985) stated that as new teaching innovations or processes are being discovered, developed, and introduced into schools, teachers tend to be more concerned about the effects of the educational innovations on their students. Darr (1985) also found that when teachers perceive changes in the curriculum to be of some benefit to their students, they were more likely to adopt educational changes.

Teachers are important stakeholders in the educational change process (Newman & Johnson, 1994). If changes in an educational program are to be successful, then the acceptance of these changes by teachers is essential (Norris & Briers, 1989). Norris and Briers also found that teachers' perceptions toward change are the single best predictor of curriculum adoption. If teachers see the relevance of new curriculum or teaching strategies, and the ways in which it can help them reach their educational goals in the classroom or lab, they will then utilize instructional resources to successfully integrate the curriculum (Knoblock, 2008).

Borich Needs Assessment Model

It is essential that I & E teachers systematically engage in meaningful learning opportunities that serve to increase their competencies as teachers. Identifying the specific needs of I & E teachers is an important first step in bridging the gap between knowledge, skills and attitudes, and teacher competency in becoming an effective teacher (Kitchel et al., 2012).

A powerful tool for identifying CTE professional development needs, and at the same time engaging the teacher in the process, is the needs assessment (Cannon et al., 2012; Smith, 2003). The Borich Needs Assessment Model has proven to be effective in identifying professional development needs of CTE teachers (Cannon, Kitchel, & Duncan, 2010; Joerger,

2003; Kitchel et al., 2012), and identifies where teachers; in-service or training needs exist by calculating mean weighted discrepancy scores (MWDS).

The Borich model is, "a discrepancy analysis that identifies the two polar positions of what is and what should be" (Borich, 1980, p. 39), and can be used to calculate a discrepancy by comparing the participants' behaviors, skills and competencies with the goals of the program. Borich (1980) stated that a comparison could be made to determine a group of individuals' perceived level of competence to complete a task with their desired level of competence to complete a task. The two most common types of discrepancy scores noted in the literature were importance/ability or what is/what should be. The distance between these discrepancy scores can be used to represent the need for training, and as an index of the training program's effectiveness (Borich, 1980, p. 39).

The Borich Needs Assessment Model consists of a list of competencies that the participants' rate using a Likert-type scale to rate perceived ability and importance for each competency. The first response scale represents teachers' perceived level of importance of the competency (1 = Not Important, 2 = Little Importance, 3 = Somewhat Important, 4 = Important, and 5 = Very Important). The second response scale represents teachers' perceived level of competence for each competency (1 = Not Competent, 2 = Little Competence, 3 = Somewhat Competent, 4 = Competent, and 5 = Very Competent) (Kitchel et al., 2012).

Analysis of the data involves the calculation of the MWDS by subtracting the competence score from the importance score (discrepancy score), multiplying that value by the mean importance rating of the item (weighted discrepancy score), and finding the average of all weighted discrepancy scores for each competence item (Cannon et al., 2012; Joerger, 2003; Smith, 2003). A MWDS for each of the competencies is then calculated by taking the sum of the

weighted discrepancy scores and dividing by the number of competencies. Using the MWDS, the competences are then ranked, and those with the highest MWDS have the highest priority for professional development (Smith, 2003).

The Borich Needs Assessment Model can be adapted to fit a variety of studies for many different institutions, but the basis for the model remains the same. The model is a self-evaluation procedure that relies on participants to make judgments about their own abilities. Borich (1980) mentioned that the underlying assumption is whether the participants can best judge their own abilities objectively. This assumption is most plausible when the model is being used for evaluating training, not the individual instructor (Borich, 1980).

Summary of Related Literature

In this chapter, I have reported on current national literature related to CTE, CTE teacher licensure, CTE professional development, and curriculum implementation. CTE teachers have unique instructional needs and challenges. Most CTE programs are primarily hands-on courses and require the teacher to understand appropriate instructional strategies that go beyond traditional lecture methods. Keeping current with technical skills is a professional development challenge in itself (Twomey, 2002).

When planning quality professional development, teachers' routes to licensure may not matter. Oregon has a dual route to CTE licensure, the traditional baccalaureate and the non-traditional CTE I license, which allows an applicant from business and industry with significant work experience and little to no teaching experience to become a certified teacher. Regardless of the pathway the teacher took to become an educator, continuing professional development is important to achieving and maintaining teacher competence (Ruhland & Bremer, 2003a).

The Borich Needs Assessment Model has been used successfully to determine the training needs of CTE teachers, regardless of the pathway that they took to become CTE teachers (Cannon et al., 2012; Cannon et al., 2010; Duncan et al., 2006; Joerger, 2002). The Borich Needs Assessment Model is a powerful tool for identifying CTE professional development needs, and at the same time engaging the teacher (adult learner) in the process (Smith, 2003). This model utilizes a descriptive survey and evaluates the perceived level of importance‖ and the perceived level of competence of teachers in regards to a given set of items identified by previous research.

Chapter Three: Research Methodology

Chapter three describes the procedures and methods used to collect, measure, and analyze data. Specifically, the research design, the selection of participants, the development of the survey instrument, strategies to address reliability and validity, and procedures in conducting the research and analyzing the data.

Purpose of the Study

The purpose of this quantitative descriptive study was to describe Oregon industrial and engineering systems (I & E) teachers' perceptions of their professional development needs. The following questions guided this study:

1. What are Oregon I & E teachers' perceived importance of specific areas of their professional development?

2. What are Oregon I & E teachers' perceived competence in specific areas of professional development?

3. What are the perceived professional development needs of Oregon I & E teachers?

Guiding Theoretical Perspective

Malcolm Knowles' theory of adult learning helped frame this study.   Knowles (1980) defined andragogy as the "art and science of helping adults learn, in contrast to pedagogy as the art and science of teaching children" (p. 43). Knowles' perspective on andragogy or adult learning theory is based on six assumptions:

1. Self-concept: Adult learners are self-directed, internally motivated, autonomous, and independent.

2. Role of experience: Adults tend to learn by drawing from their previous experiences and knowledge.

3. Readiness to learn: Adults tend to be ready to learn what they believe they need to know.

4. Orientation to learning: Adults learn for immediate applications rather than for future uses.

5. Internal motivation: Adults are more internally motivated than externally.

6. Need to know: Adults need to know the value of learning and why they need to learn.

Knowles (1980) stated the adult learner is likely to disengage from those learning activities for which there is no perceived need. CTE teachers want to know the relevance of what they are learning to what they want to achieve. The first task of the professional development facilitator is to help the learners become aware of the "need to know." This can be accomplished by using real or simulated experiences in which the learners discover for themselves the gaps between where they are now and where they want to be (Knowles, Holton, & Swanson, 2005).

In order to make professional development meaningful to CTE teachers, Knowles (1980) wrote that in adults, readiness to learn is dependent on an appreciation of the relevancy of the topic. Adults like to be given opportunity to use their existing knowledge and experience gained from life experience, and apply it to their new learning experiences. "Any group of adults will be more heterogeneous in terms of background, learning style, motivation, needs, interests, and goals than is true of a group of youths" (Knowles, Holton, & Swanson, 2005, p. 66). So, for many kinds of learning, the best resources for learning exist in in the adult learners themselves.

A needs assessment creates a snapshot of the current thinking of I & E teachers toward professional development. Survey respondents provided data that can be weighted and ranked in order of priority so that responses are linked to a practical decision framework for program improvement. Borich (1980) asserted that a comparison could be made that would determine a

group of individuals' perceived level of competence to complete a task, with their desired level of competence to complete a task. As Knowles stated, adult learners tend to become ready to learn things that they believe are important (1980). Adult students become ready to learn when "they experience a need to learn it in order to cope more satisfyingly with real-life tasks or problems" (Knowles, 1980 p 44).

The identification of priorities for professional development of I & E teachers focuses on the theory on what is most important to I & E teachers. Adult learning theory states that the adult learner would have a higher level of motivation to learn when there is a perceived need. When seeking to identify priorities for professional development, teachers are an important source of data (Kitchel et al., 2012; Knowles, 1980).

Research Design

The design used for this study was descriptive in nature, used data from a cross-sectional survey, and sought to determine mean weight discrepancy scores using Borich's Needs Assessment Model. Dillman et al. (2009) states that cross-sectional surveys look at a population at a single point in time. The web-based survey used in this study sought to collect data from Oregon I & E teachers that showed the perceived importance of 35 professional development items and their perceived ability to teach those same 35 professional development areas.

Population

The target population (N=193) for this study was the 2013-2014 school year Oregon secondary I & E teachers as identified by the Oregon CTE regional coordinators (Appendix A). The small size of the state and the population being studied made a census study feasible. Because of the use of a census population, no sampling methods were utilized and consequently, generalizability of the findings may be limited to the population of the study.

In the State of Oregon Carl Perkins funds are directed only to the programs of study approved by the Oregon Department of Education (ODE). These are programs are designed by secondary and postsecondary partners to be a series of complete, yet non-duplicative career-focused courses. Programs of study emphasize technical, academic and career knowledge and skills acquired in applied career contexts. The CTE program approval process determines a program's ability to establish and sustain the CTE program of study core elements and the ability to provide students with the necessary skills for entry-level jobs or acceptance at a postsecondary institution. To attain the CTE program of study approval, a program must have documented implementation evidence for each of the core element indicators (R. Dodge, personal communication, July 17, 2014). The five core elements are: (a) standards and content; (b) alignment and articulation; (c) accountability and evaluation; (d) student support services; and (e) professional development (R. Dodge, personal communication, July 17, 2014).

ODE has created a database that lists all of the approved programs of study in Oregon by institution, career area, program title, and renewal dates, among other data. A list of all CTE teacher contacts of approved programs of study in Oregon was completed in the spring of 2013 by asking all regional coordinators in the state to populate the ODE database with current instructor contact information, including first and last name and current email address. The database was sent out again to regional coordinators in early October 2013 to confirm the accuracy of the database. The resulting database contained 210 state approved I & E programs of study. After eliminating duplicate contact information for those teachers who teach in multiple content areas, the population for this study was 193.

Instrumentation

This descriptive study utilized a web-based survey based on the Borich Model (1980) and following the principles described by Dillman et al. (2009). After a review of the literature, the Borich model was determined to be an appropriate tool for assessing professional development needs for CTE instructors, and a web-based survey was the best means for conducting this type of study (Cannon et al., 2012; Dillman et al., 2009; Dunkel, 1953; Kitchel et al., 2012).

Competency models such as the Borich Needs Assessment Model are designed to assess the skills individuals need to be effective in the future. According to Zarafshani and Baygi (2008), "Competency-based training encourages teachers to assess their level of competence in a given area and participate in training that is relevant, useful and often customized to their learning styles" (p. 350). The 35 professional development areas selected for this study were taken from a combination of the 2011 Association for Professional Development in Career and Technical Education (APDCTE) annual survey and previous research on Idaho secondary career and technical teachers by Cannon et al. (2012).

The original APDCTE survey was developed in 2004 and was administered to the National Association of State Directors of Career and Technical Education Consortium members (NASDCTEc), also informally known as the State Directors, and has been modified and administered every fall since 2004. Besides the State Directors, the survey is also sent to Organizational Members representing CTE-friendly organizations such as leaders in business and industry, career and technical directors, and coordinators of professional development. The APDCTE instrument contains 49 topical statements which describe priorities in career and technical education, along with space for write-in items. The APDCTE survey asks the State Directors or their designee to identify up to ten items on the survey instrument as a priority in

their state. Utilizing descriptive statistics, rank was assigned to each of the 49 items. In this survey, the top five items were; (a) integration of academics and CTE, (b) school emergency plans, (c) student conflict resolution, (d) CTE teacher technical skill updating, and (e) dual enrollment/advanced standing programs for secondary CTE students (Wichowski & Arnold, 2011).

Cannon et al., (2012) modeled their survey in part on the Duncan et al., (2006), Joerger (2002) and Garton and Chung (1997) instruments. Based on the Borich Needs Assessment Model (Borich, 1980), Cannon et al., (2012) developed a 35 topic survey instrument that dealt with teaching and learning specific to CTE teachers. Their survey was sent out to 73 participants within the state of Idaho. The MWDS analysis indicated the five highest in-service needs as; (a) utilizing computer numerical control software and applications, (b) teaching students to think critically and creatively, (c) motivating students to learn, (d) integrating science standards into the CTE curriculum, and (e) teaching problem solving and decision-making skills.

Other important influences that shaped the development of the survey instrument for this research included national career and technical education trends (e.g., accountability, standards, and common core state standards), emerging technology applications (e.g., blended learning), and topics of current focus within the career and technical education literature as reported in the literature review.

The resulting instrument contains two sections; the first contains items pertaining to teacher characteristics, including their CTE content area, teacher preparation and certification, and teaching experience, while the second lists 35 professional development items which cover four broad categories. The categories include technology, curriculum, pedagogy, and Carl Perkins programs of study. The instrument design allows teachers to rate each item on two

distinct five-point response scales, perceived level of importance of the item to the content area of I & E (i.e., 1=Not Important, … 5=Very Important) and perceived level of competence (ability) for each item (i.e., 1=Not competent, …5=Very Competent).

Validity

Validity is "the most important characteristic a test or measure can have" (Ary, Jacobs & Sorenson, 2010, p. 225). Content validity refers to "examining the content of a test to determine whether the items represent the thing you are trying to measure" (Johnson & Christensen, 2000, p. 107).

Face validity is examining the instrument in order to see if it is valid for the intended purpose (Ary, Jacobs, & Sorensen, 2010). Ary et al (2010) and Dillman et al. (2009) stress that establishing face validity is the most important due to the fact that participants are more likely to finish a questionnaire, which gives the impression to be both meaningful and appropriate. Saucier (2010) summarizes validity as "the assumption that the intended measurement was indeed measured by the instrument" (p. 76). For this study, both face and content validity were addressed in order to determine the overall validity of the survey instrument.

To address instrument validity, a panel of CTE experts in Oregon was asked to provide feedback on the clarity, completeness, and validity of the instrument. The expert panel was comprised of 16 Oregon regional coordinators who are responsible for CTE programs in their region, including developing and promoting professional development activities. Based on their input, items were reworded and/or clarified. The expert panel determined that the questions were valid and the instrument met the purpose and objectives of the study.

Reliability

        The reliability of a survey is the degree of consistency with which the survey instrument measures whatever it is measuring (Ary et al., 2010). According to Johnson and Christensen (2000), if a test or assessment is reliable, it will produce similar scores or responses on every occasion. While designing a perfectly reliable instrument is often challenging, the researcher must make efforts to establish reliability and to improve the reliability if possible (Saucier, 2010). For this study, a pilot study was first conducted in order to establish instrument reliability.

        Ary, et al. define a pilot study as, "[a] trial run with a few subjects to assess the appropriateness and practicability of the procedures and data-collecting instruments" (2010, p. 647). Dillman, Smyth and Christian (2009) suggest pilot surveys can be used to get an indication whether individual questions and scales appear to be working as intended. The participants of the pilot study should be similar in demographic characteristics to the study population (Ary et al., 2010; Dillman et al., 2009). Gall, Gall and Borg (1999) suggest that it is not possible to predict how instrument items will be interpreted and answered by respondents unless a pilot study is conducted first. Additionally, Gall et al. recommend analyzing the results from the pilot study to get a clearer picture of the reliability of the instrument (1999).

        The survey instrument was pilot tested by five I & E CTE teachers in Washington State who represented both rural and urban, and large and small schools. An invitation to take the web-based survey was emailed to the group of secondary CTE teachers in Washington State, explaining the purpose of the study the pilot test, along with informed consent and the survey protocol. Feedback from the pilot test was used to revise the instrument, clarify the questions, and to ensure a completion time of less than ten minutes.

Internal consistency refers to how well a test measures a single concept. Cronbach's

Alpha can be used when items have multiple response categories such as the Likert-type

response categories used in the needs assessment section of this study (Ary et al., 2010; Johnson

& Christensen, 2000). Cronbach's Alpha was used to measure the internal-consistency of the

needs assessment portion of the pilot test using the Statistical Package for Social Sciences

(SPSS) version 21. The reliability coefficient (Table 3.1) for the needs assessment portion of the

pilot survey was .979. A measure is considered reliable if its reliability coefficient is .80 or

higher (Gall, Gall, & Borg, 1999).

Table 3.1

Reliability of Instrument

Cronbach's alpha	Cronbach's alpha based on standardized items	N
.799	.979	36

Strategies for the Protection of Human Subjects

After the data collection instrument was developed, and prior to implementation of the

data collection process, the researcher submitted a proposed plan outlining the data collection

process and all related materials to the Oregon State University Institutional Review Board

(IRB). The data collection process began after receiving consent from the IRB and followed the

requirements and conditions described in the approval notice.

Data Collection

Data were collected using Dillman's Tailored Design Method for mixed-mode surveys

with a web-based survey (Dillman et al., 2009). Regional coordinators were asked to inform I &

E teachers in their regions of the upcoming research study and encourage their participation. A

formal email invitation was sent to each identified secondary I & E teacher in Oregon on January

7, 2014 (Appendix B). The email provided information about the researcher, the purpose of the

study, voluntary participation, and a link to the web-based survey through Qualtrics®. Each

participant was sent a unique invitation link to ensure that the data was only collected from the

intended population. In addition, the invitation link was used to keep track of responses. Two

$50 Visa gift cards were used as an incentive to encourage teacher participation; all teachers who

completed the questionnaire were entered into the drawing for a chance to win one of the gift

cards.

Follow-up procedures were used to gain an improved response rate. According to

Dillman (2009), a survey that fails to have follow-up contact with the respondents typically has

response rates that are noticeably lower than those obtained with follow-ups. Dillman (2004)

also indicated that because teachers receive numerous emails each day, along with the numerous

activities and assignments, nonresponse is more often due to simple oversight than a conscious

refusal. Non-respondents were sent a reminder email with the link to the web-based survey on

January 14, 2014 in the form of an email generated in Qualtrics®.

A third contact with participants occurred January 20, 2014. This email included a URL

to the web-based survey and an explanation as to the importance of the participants' response.

The fourth email was sent on January 23, 2014 and was written in such a way as not to

"overcome resistance, but rather to jog memories and rearrange priorities" (Dillman, 2009, p.

179) and a final reminder was sent on January 28, 2014 (Appendix C). Response rates for each

phase of the data collection are shown in Table 3.2.

Table 3.2

Number of Responses by Data Collection Phase

1/7/2014	1/14/2014	1/20/2014	11/23/2014	1/28/2014
51.8%	20.5%	10.7%	10.7%	6.3%

A final response rate of 58.5% was achieved. Of those participants who did not respond, one opted out via email and eight emails bounced back. All attempts to correct the remaining eight addresses failed.

Analysis of nonresponse bias is important in determining a sample's representativeness of the population from which it was drawn. For this study early respondents and late respondents were compared to monitor for nonresponse error through the use of an independent samples *t*-test. Early respondents (n = 75) were defined as the responses generated by the first two emails. Late respondents (n = 28) were defined as the responses generated by the third, fourth and fifth reminders. The third, fourth, and fifth groups were combined in order to meet the minimum number of late respondents for comparison, as suggested by Lindner, Murphy, and Briers (2001). No statistically significant difference was found on the importance ratings between early respondents (*M* = 3.85, *SD* = .51) (*t* (100.5) = -1.349, p>.05). The results of the independent samples *t*-test compared competence rating between early responders (*M* = 3.60, *SD* = .60) and late responders (*M* = 3.71, *SD* = .51) (*t* (100.5) = -0.86, p=0.05). Based on these findings, the sample data was determined to be representative of the population from which it was drawn.

Analysis of Data

The data collected from this instrument were analyzed using Microsoft Office Excel®
2013 and Statistical Package for the Social Sciences® (SPSS) version 21 software. Frequencies,
percentages, and mean weighted discrepancy scores (MWDS) were calculated for each of the
competencies for both importance and ability.

MWDS were calculated for each of the 35 professional development items, using an
Excel® MWDS calculator developed by Dr. McKim of Texas A&M University (B. McKim,
personal communication, December 30, 2013). To calculate the discrepancy score the ability
rating was subtracted from the importance rating for each participant on each competency. The
discrepancy score was then multiplied by the mean importance rating of the competency in order
to calculate the weighted discrepancy score for each individual on each competency. Next, the
mean weighted discrepancy score (MWDS) for each of the competences was calculated by
taking the sum of the weighted discrepancy scores and dividing by the number of observations.
Figure 3.1 shows Dr. McKim's (2013) formula for calculating MWDS (B. McKim, personal
communication, December 30, 2013).

$$\text{MWDS} = \frac{\sum[M_{\text{Associated Importance Rating}} (\text{Importance} - \text{Ability})]}{n}$$

Figure 3.1 Formula for Mean Weight Discrepancy Score

Chapter Four: Results

The purpose of this quantitative descriptive study was to describe Oregon & E teachers'

perceptions of their professional development needs. This chapter is divided into two sections;

the first contains items pertaining to the characteristics of Oregon I & E teachers who completed

the survey instrument, including their CTE content area, teacher preparation and certification,

and teaching experience, while section two is a discussion of the results of the data analysis

reported for each research question. The organization of section two has been arranged according to

the three questions that guided this study. These questions are:

1. What are Oregon I & E teachers' perceived importance of specific areas of their

    professional development?

2. What are Oregon I & E teachers' perceived competence in specific areas of

    professional development?

3. What are the perceived professional development needs of Oregon I & E teachers?

Oregon I & E Demographics

Electronic surveys were sent to 193 I & E high school teachers in Oregon; 122 surveys

were completed for a response rate of 58%. There were ten partial responses that were used for

demographic purposes only and not included in the data analysis.

Demographic items were included in the survey to gain further insight about the

respondents. Table 4.1 compares the survey participants' age, gender, and years of experience in

teaching. Male teachers comprised the largest group of respondents ($n = 112$, 91.0%). Over half

of the Oregon I & E respondents were over 50 years old ($n = 74$, 61.0%). The age group with the

most years of teaching experience was the 60 to 69 year olds ($m = 23.6$), while they only

accounted for 12.5% of the participants surveyed. The participating teachers' years of teaching

experience ranged from one to 41 ($m = 18.64$).

Table 4.1

Comparison of Oregon I & E Teachers' Age and the Average Years of Experience by Age Group

(N =122)

Age	Number of Females	Number of Males	Total Number of Teachers	Average Years of Experience
25-30	0	5	5	5.3
31-39	1	13	14	9.3
40-49	2	27	29	14.6
50-59	7	53	60	23.1
60-69	0	14	14	23.6
$m = 48.5$	$n = 10$	$n = 112$	$n = 122$	$m = 15.18$

Respondents were asked to identify the content area(s) that best fit the area in which they

teach. Many Oregon CTE teachers teach in different content areas due to the size of their school

or their background, so respondents had the option of choosing more than one content area.

Table 4.2 summarizes the response rates of males and females by content area. Male teachers

comprised the largest group of respondents ($n = 102$, 91.0%) with the majority of them teaching

in the manufacturing content area ($n = 38$, 34.0 %) followed by construction ($n = 30$, 26.8%).

The majority of the female I & E teachers taught information and communication technology (n

$= 4$, 40.0%) followed by manufacturing ($n = 3$, 30.0%) and engineering drafting ($n = 2$, 20.0%)

and engineering ($n = 2$, 20.0%).

Table 4.2

Comparison of Respondents by Gender and Content Area (N = 122)

Gender	Automotive and Heavy Equipment	Engineering	Engineering Drafting	Construction	Information and Communication Technology	Manufacturing
Male	15 (13.4%)	23 (20.5%)	17 (15.2%)	30 (26.8%)	11 (9.0%)	38 (34.0%)
Female	1 (10.0%)	2 (20.0%)	2 (20.0%)	1 (10.0%)	4 (40.0%)	3 (30.0%)

Note. Oregon I & E teachers may teach in more than one content area, within or out of the I & E content area. Respondents were only given the choice of choosing within the I & E content area.

Many school districts are facing the challenges of improving student achievement, teaching content that is integrated with academics, meeting both industry and articulation standards, and working with a growing population of diverse learners, all with a teaching force that increasingly, has not had the opportunity and benefit of traditional, formal teacher education.

The major institution in Oregon that offered I & E teacher education closed its program in the late 90s. With the absence of a traditional I & E teacher preparation program in Oregon, there has been an increase in the number of alternatively certified I & E teachers within the state. The governing body of teacher licensure in Oregon is aware of the increase in alternatively certified CTE teachers, and they have created pathways for I & E teachers to become certified. However, it is unclear how many alternatively certified I & E teachers there are in Oregon.

While not the focus of the study, the decision to add a question regarding teacher licensure to this study was based in part on the researcher's position as a regional coordinator for CTE and his role in licensing CTE teachers. Extensive studies on the differences of alternatively and traditionally certified teachers and the pre-service and in-service training needs they need have been conducted (Berdnarz et al., 2004; Bottoms & McNally, 2005; Ruhland & Bremer,

2003a; Smith, 2003; Suell & Piotrowski, 2007). As the number of alternatively licensed I & E

teachers in Oregon is relatively high, the researcher believed this may be an important factor in

teacher perceptions of professional development needs. It was determined through independent

sample t-tests that there were no differences between alternatively and traditionally certified

teachers responses.

Participants were asked to identify the type of teacher preparation program they

completed to become an Oregon I & E teacher. Table 4.3 summarizes the response rates of the

type of teacher preparation program that each participant completed. The majority of the

respondents ($n = 74$, 66.1%) of respondents obtained their certification through a traditional

teacher education program, while teachers completing an alternative licensure program made up

32.1% ($n = 36$), and 2% ($n = 2$) were currently completing an alternative licensure program.

Table 4.3

Comparison of Teacher Responses to the Type of Teacher Preparation Program They Completed

(N = 112)

Teacher Preparation Program	*Number*	*%*
Traditional Teacher Program	74	66.1
Alternative Licensure Program	36	32.1
Currently Completing an Alternative Program	2	1.8
Total	112	100%

Table 4.4 summarizes further the response rates of the type of teacher preparation

program each participant completed by comparing the years of teaching experience with the

reported teacher preparation program. Those participants who had taught for more than 21 years

(*n* = 40, 35.7%) completed a traditional teacher education program, while those with 20 years or less experience (*n* = 30, 26.8%)indicated that they had gone through an alternative certification program, or were in the process of completing an alternative certification program.

Table 4.4

Comparison of Teacher Responses to the Type of Teacher Preparation Program They Completed to Their Years of Teaching (N = 112)

Years of Teaching	Teacher Certification		
	Traditional	Alternative	In Process/Alternative
1 - 10	15 (13.4%)	11 (9.8%)	1 (0.8%)
11 - 20	19 (17.0%)	18 (16.1%)	0 (0%)
21 - 30	31 (27.7%)	4 (3.6%)	1 (0.8%)
31 - 41	9 (8.0%)	3 (2.7%)	0 (0%)
Total	74 (66.1%)	36 (32.2%)	2 (1.6%)

A comparison of the participants' age and teacher preparation program they completed indicates that 35.0% (*n* = 39) of the 50–59 year olds went through a traditional teacher preparation program while 17.0% (*n* = 19) of the 40–49 year olds completed a traditional teacher preparation program, followed by the 31–39 year olds and 60–69 years olds with 6.3% (*n* = 7) each. The 50–59 years had a higher proportion in the alternative certification with 12.0% (*n* = 13), followed by the 40–49 year olds (*n* = 8, 7.1%). Table 4.5 summarizes the comparison of teacher responses to the type of teacher preparation program they completed with their age.

Table 4.5

Comparison of Teacher Responses to the Type of Teacher Preparation Program They Completed to Their Age (N = 112)

Age	Traditional	Alternative	In Process Alternative
25-30	3 (2.7%)	6 (5.4%)	0
31-39	7 (6.3%)	5 (4.5%)	0
40-49	19 (17.0%)	8 (7.1%)	0
50-59	39 (35.0%)	13 (12.0%)	1 (0.9%)
60-69	7 (6.3%)	5 (4.5%)	1 (0.9%)
Total	75 (67.3%)	36 (33.5%)	2 (1.8%)

Finally, the analysis showed that 12 of the automotive instructors ($n = 22$, 54.5%) obtained their teaching certification through an alternative teacher preparation program although this only accounts for 33.3% of the total responses ($n = 122$). Fourteen (45.1%) of the 31 construction teachers reported completing an alternative teaching preparation program, while 14 (29.2%) of the 48 manufacturing teachers reported going through an alternative teacher education program, accounting for 39.3% ($n = 122$) of all respondents. Table 4.6 summarizes the respondents' teacher preparation programs by content area.

Table 4.6

Comparison of Teacher Responses to the Type of Teacher Preparation Program They Completed

to Their Content Areas (N = 122)

Teacher Certification	Automotive and Heavy Equipment	Engineering	Engineering Drafting	Construction	Information and Communication Technology	Manufacturing
Traditional	10 (8.2%)	25 (20.5%)	21 (17.2%)	17 (13.9%)	15 (12.3%)	33 (27.0%)
Alternative	12 (9.8%)	2 (1.6%)	2 (1.6%)	14 (11.5%)	1 (0.8%)	14 (11.5%)
In Process/ Alternative	0	2 (1.6%)	0	0	0	1 (0.8%)

Note. Oregon I & E teachers may teach in more than one content area, within or out of the I & E content area. Respondents were only given the choice of choosing within the I & E content area.

Findings Related to Question One: What are Oregon I & E Teachers' Perceived

Importance of Specific Areas of Their Professional Development?

The purpose of Question One was to determine each respondent's perceived level of importance for 35 professional development competencies. This information was used to determine the mean weighted discrepancy score (MWDS) and the rank of each competency in order to prioritize the in-service needs of Oregon I & E teachers.

Teachers were asked to rate 35 professional development areas using the five-point Likert-type scale found in Table 4.7.

Table 4.7

Likert-type Ratings for Importance

Number Rating	Level of Importance
1	Not Important
2	Low Importance
3	Somewhat Important
4	Important
5	Very Important

Of the 35 professional development areas, 18 (51.4%) were rated "Important," 14 (40%) were rated "Somewhat Important," and three (8.6%) were rated "Low Importance." None of the competencies were rated "Very Important" or "Not Important." The range of importance ratings ranged from a low of 2.91, to a high of 4.68 on the five-point scale (Table 4.8). For a complete listing, see Appendix E.

Table 4.8 summarizes those professional development areas with an average rating of "Important" as indicated by the five-point Liker-type ratings. There are 18 (51.4%) professional development areas in this category. The professional development areas that were rated the highest were "teaching students to think critically and creatively" ($M = 4.68$, $SD = .51$); and "motivating students to learn" ($M = 4.62$, $SD = .56$). Other important items were "develop and maintain required safety standards" ($M = 4.47$, $SD = .80$); "CTE teacher technical skills updating" ($M = 4.35$, $.74$); and "student employability skills programs" ($M = 4.35$, $SD = .77$).

Table 4.8

Professional Development Areas, Rated "Important" by Oregon I & E Teachers and Ranked by

Mean (n = 18)

Professional Development Area	N	Minimum	Maximum	Mean	SD
Teaching students to think critically and creatively	103	3	5	4.68	0.51
Motivating students to learn	103	3	5	4.62	0.56
Develop and maintain required safety standards (State and Federal/OSHA standards)	102	1	5	4.47	0.80
CTE teacher technical skill updating	101	1	5	4.35	0.74
Student employability skills programs	101	2	5	4.35	0.77
Program needs related to career pathways	101	2	5	4.29	0.65
Career awareness for CTE students and parents	103	1	5	4.26	0.84
Business and educational partnership	102	1	5	4.25	0.89
Meeting learning styles needs	103	2	5	4.22	0.71
Understanding federal (Perkins), state, and local funding	102	1	5	4.14	0.93
Student recruitment	99	1	5	4.13	0.94
Providing guidance and career exploration activities to students	103	2	5	4.11	0.75
Dual enrollment and articulation programs for CTE students	103	1	5	4.10	0.98
Curriculum development and revision	103	1	5	4.06	0.88
Literacy in CTE	103	2	5	4.05	0.72
Contextualization of instruction	103	1	5	4.05	0.81
Math in CTE	97	2	5	4.04	0.76
Developing an effective public relations program	100	1	5	4.02	0.90

Table 4.9 summarizes the professional development areas with an average rating of "Somewhat Important" by survey participants as indicated by the five-point Liker-style ratings. There are 14 (40.0%) professional development areas in this category. "Developing curriculum-based School-to-Work and/or School-to-Career activities" ($M = 3.92$, $SD = 0.90$) was the highest rated professional development competency in the "Somewhat Important" category followed by "Seamless curriculum development" ($M = 3.91$, $SD = 0.83$) and "Program related trends and current issues" ($M = 3.91$, $SD = 0.75$).

Table 4.9

Professional Development Areas, Rated "Somewhat Important" by Oregon I & E Teachers and

Ranked by Mean (n = 14)

Professional Development Area	N	Minimum	Maximum	Mean	SD
Developing curriculum-based School-to-Work and/or School-to-Career activities	102	1	5	3.92	0.90
Seamless curriculum development	100	1	5	3.91	0.83
Program related trends and current issues	100	2	5	3.91	0.75
Evaluating a CTE program	102	1	5	3.83	0.89
Grant writing and funding opportunities	102	1	5	3.81	1.03
Cultural, equity and diversity awareness	103	1	5	3.81	0.89
Establishing and using a program advisory committee	101	1	5	3.78	0.91
Meeting the needs of limited English proficiency CTE students	103	1	5	3.67	0.87
Assessment rubrics	102	1	5	3.64	0.91
Use of industry-based certifications	103	1	5	3.53	1.08
Design and develop digital learning experiences	103	1	5	3.53	1.03
Design and develop digital learning assessments	103	1	5	3.35	1.00
Common Core State Standards	103	1	5	3.19	1.04
Oregon Career Information System	103	1	5	3.11	0.96

Three (8.6%) professional development areas had an average rating of "Low Importance" as indicated by the five-point Liker-style ratings. Table 4.10 summarizes this data.

Table 4.10

Professional Development Areas Rated "Low Importance" by Oregon I & E Teachers and

Ranked by Mean (n = 3)

Professional Development Area	N	Minimum Rating	Maximum Rating	Mean	SD
Completing reports for local and state agencies	100	1	5	2.99	1.20
Use of distance learning technologies	102	1	5	2.97	1.05
Utilize website development software	101	1	5	2.91	1.08

An independent-samples t-test was conducted to compare traditionally prepared I & E

teachers importance ratings and alternatively prepared I & E teachers importance ratings. No

statistically significant difference was found in the importance ratings between traditionally

prepared teachers respondents ($M = 3.85$, $SD = 0.49$) and alternatively prepared teachers

respondents ($M = 3.07$, $SD = 0.42$) (t (101) = -1.22, p > .05).

Findings Related to Question Two: What are Oregon I & E Teachers' Perceived

Competence in Specific Areas of Professional Development?

Oregon I & E teachers were asked to rate their perceived competence on the same 35

professional development areas as above, but using a different five-point Likert-type scale found

in Table 4.11.

Table 4. 11

Ratings for Competency

Number Rating	Level of Importance
1	Not Competent
2	Low Competency
3	Somewhat Competent
4	Competent
5	Very Competent

Of the 35 professional development areas, four (2.9%) were rated "Competent," 29 statements (82.8%) were rated "Somewhat Competent," and two (5.7%) were rated "Low Competency." None of the professional development areas were rated "Not Competent" or "Very Competent." The average professional development areas ratings ranged from a low of 2.72, to a high of 4.18 on the five-point scale. For a complete listing, see Appendix F.

Table 4.12 summarizes those professional development areas with an average rating of "Competent" as indicated by the five-point Liker-style ratings. Teachers perceived that they were "Very Competent" in "Teaching students to think critically and creatively" ($M = 4.18$, $SD = .79$), "Develop and maintain required safety standards" (State and Federal/OSHA) ($M = 4.07$, $SD = 1.0$), "Motivating students" ($M = 4.06$, $SD = .80$) and "Curriculum development and revision" ($M = 4.02$, SD = .9).

Table 4. 12

Professional Development Areas Rated "Competent" by Oregon I & E Teachers and Ranked by

Mean (N = 4)

Professional Development Area	N	Minimum Rating	Maximum Rating	Mean	SD
Teaching students to think critically and creatively	103	0	5	4.18	0.79
Develop and maintain required safety standards (State and Federal/OSHA standards)	102	2	5	4.07	1.00
Motivating students to learn	103	0	5	4.06	0.80
Curriculum development and revision	102	0	5	4.02	0.90

Table 4.13 summarizes those professional development areas with an average rating of "Somewhat Competent" as indicated by the five-point Liker-type ratings. There are 29 (82.9%) professional development areas in this category. Teachers perceived they were somewhat competent in "Meeting learning style needs" ($M = 3.99$, $SD = 0.85$), "Cultural, equity and diversity awareness" ($M = 3.96$, $SD = 0.85$), "Literacy in CTE" ($M = 3.90$, $SD = 0.86$), and "Program needs related to career pathways" ($M = 3.89$, $SD = 0.94$).

Table 4.13

Professional Development Areas, Rated "Somewhat Competent" by Oregon I & E Teachers and

Ranked by Mean (N = 29)

Professional Development Area	N	Minimum	Maximum	Mean	SD
Developing curriculum-based School-to-Work and/or School-to-Career activities	102	1	5	3.92	0.90
Seamless curriculum development	100	1	5	3.91	0.83
Program related trends and current issues	100	2	5	3.91	0.75
Evaluating a CTE program	102	1	5	3.83	0.89
Grant writing and funding opportunities	102	1	5	3.81	1.03
Cultural, equity and diversity awareness	103	1	5	3.81	0.89
Establishing and using a program advisory committee	101	1	5	3.78	0.91
Meeting the needs of limited English proficiency CTE students	103	1	5	3.67	0.87
Assessment rubrics	102	1	5	3.64	0.91
Use of industry-based certifications	103	1	5	3.53	1.08
Design and develop digital learning experiences	103	1	5	3.53	1.03
Design and develop digital learning assessments	103	1	5	3.35	1.00
Common Core State Standards	103	1	5	3.19	1.04
Oregon Career Information System	103	1	5	3.11	0.96

Table 4.14 summarizes those professional development areas with an average rating of

"Low Competency" as indicated by the five-point Liker-style ratings. There are 2 (5.7%)

professional development areas in this category. Teachers rated "Use of distance learning

technologies" (*M* = 2.99, *SD* = 1.24) and "Utilize website development software" (*M* = 2.72, *SD* = 1.18) in this category.

Table 4.14

Professional Development Areas Rated "Low Competency" by Oregon I & E Teachers and Ranked by Mean (N = 2)

Professional Development Area	N	Minimum Rating	Maximum Rating	Mean	SD
Use of distance learning technologies	101	12	5	2.99	1.24
Utilize website development software	101	13	5	2.72	1.18

An independent-samples t-test was conducted to compare traditionally prepared I & E teachers competence ratings and alternatively prepared I & E teachers competence ratings. No statistically significant difference was found in the competence ratings between traditionally prepared I & E teachers (*M* = 3.59, *SD* = 0.60) and alternatively prepared I & E teachers in this study (*M* = 3.72, *SD* = 0.54) (t(101) = -1.09, p > .05).

Findings Related to Question Three: What are the Perceived Professional Development Needs of Oregon I & E Teachers?

A Mean Weighted Discrepancy Score (MWDS) was calculated by combining the perceived levels of importance with the perceived levels of competency to determine the professional development needs of Oregon I & E teachers. What follows is a breakdown of the ranked MWDS. For a complete listing, see Appendix F. Table 4.15 shows the MWDS process.

Table 4.15

Mean Weight Discrepancy Score Formula

MWDS =	$\dfrac{\sum[M_{\text{Associated Importance Rating}} (\textbf{Importance} - \textbf{Ability})]}{n}$

Note: M Associated Ratings refer to the mean associated with each competency or item.

The MWDS ranged from -1.46 to 2.84. Table 4.16 summarizes the top 15 professional development areas as ranked by Oregon I & E teachers. Those items with higher MWDS are those with the greatest need for professional development. Based on the MWDS rankings, the most needed areas for professional development are "grant writing and funding opportunities" (*MWDS* = 2.84), "motivating students to learn" (*MWDS* = 2.42), "developing curriculum-based School-to-Work and/or School-to-Career activities" (*MWDS* = 2.42) and "business and educational partnerships" (*MWDS* = 2.38).

Table 4.16

Top 15 Ranked Professional Development Areas Sorted by Mean Weight Discrepancy Scores

(MWDS) (N = 35)

Professional Development Area	Ranking	Importance M	Competence M	MWDS
Grant writing and funding opportunities	1	3.81	3.05	2.84
Motivating students to learn	2	4.62	4.06	2.42
Developing curriculum-based School-to-Work and/or School-to-Career activities	3	3.92	3.26	2.42
Business and educational partnership	4	4.25	3.63	2.38
Providing guidance and career exploration activities to students	5	4.11	3.52	2.27
Understanding federal (Perkins), state, and local funding	6	4.14	3.56	2.23
Student employability skills programs	7	4.35	3.77	2.19
Teaching students to think critically and creatively	8	4.68	4.18	2.14
CTE teacher technical skill updating	9	4.35	3.82	1.94
Developing an effective public relations program	10	4.02	3.45	1.85
Career awareness for CTE students and parents	11	4.26	3.83	1.70
Student recruitment	12	4.13	3.67	1.59
Develop and maintain required safety standards (State and Federal/OSHA standards)	13	4.47	4.07	1.58
Meeting the needs of limited English proficiency CTE students	14	3.67	3.22	1.57
Program needs related to career pathways	15	4.29	3.89	1.53

Table 4.17 summarizes the bottom 20 professional development areas as ranked by Oregon I & E teachers. The areas of lowest priority for professional development needs are common core state standards (*MWDS* = -1.46), cultural, equity and diversity awareness (-0.78), completing reports for local and state agencies (*MWDS* = -0.77), and use of industry-based certifications (*MWDS* = -0.17).

Table 4.17

Bottom 20 Ranked Professional Development Areas Sorted by Mean Weight Discrepancy Scores

(MWDS) (N = 35)

Professional Development Area	Ranking	Importance M	Competence M	MWDS
Contextualization of instruction	16	4.05	3.71	1.38
Seamless curriculum development	17	3.91	3.59	1.13
Program related trends and current issues	18	3.91	3.56	0.94
Dual enrollment and articulation programs for CTE students	19	4.10	3.88	0.91
Meeting learning styles needs	20	4.22	3.99	0.82
Design and develop digital learning assessments	21	3.35	3.10	0.75
Establishing and using a program advisory committee	22	3.78	3.50	0.75
Design and develop digital learning experiences	23	3.53	3.33	0.72
Evaluating a CTE program	24	3.83	3.61	0.71
Math in CTE	25	4.04	3.83	0.50
Utilize website development software	26	2.91	2.72	0.46
Literacy in CTE	27	4.05	3.90	0.43
Assessment rubrics	28	3.64	3.63	0.18
Curriculum development and revision	29	4.06	4.02	0.16
Use of distance learning technologies	30	2.97	2.99	-0.03
Oregon Career Information System	31	3.11	3.12	-0.12
Use of industry-based certifications	32	3.53	3.54	-0.17
Completing reports for local and state agencies	33	2.99	3.22	-0.63
Cultural, equity and diversity awareness	34	3.81	3.96	-0.78
Common Core State Standards	35	3.19	3.61	-1.46

Given the number of Oregon I & E teachers who completed the survey and have received an alternative CTE license ($n = 38$, 34%), an independent-samples t-test was conducted to compare traditionally prepared I & E teachers competence ratings and alternatively prepared I & E teachers MWDS. No statistically significant difference was found in the MWDS ratings between traditionally prepared teachers ($M = 1.20$, $SD = 1.76$) and alternatively prepared teachers who participated in this study ($M = 1.13$, $SD = 1.31$) (t(68) = .19, p > .05).

Participants were given the opportunity to add their own competencies and rate their perceived importance and competency for that item. Eleven (9.9%) of the participants chose to do so. Five items were determined to be competency statements. They are; "Keeping technical skills current" (importance = 5, competence = 3), "Collaboration with other teaches [sic] with the same content area" (importance = 4, competence = 4), "Digital Design and fabrication" (importance = 5, competence = 5), "Usable PD" (importance = 5, competence = 5), and "Program specific training", (importance = 5, competence = 4). Six of these items are considered "statements" as opposed to competencies. These statements included; "We are being drowned in a sea of legislative paperwork," "Support from administration to go off campus to complete real projects: i.e. roofs, siding, concrete, etc. I think very important, my current ability to do this task is limited by my central office," "Keeping Administrators from destroying our program," "CTE needs alternative standards more applicable than CCS i.e. CCTC or State Skill Sets," and "State MAT in CTE programs."

Chapter Five: Discussion and Conclusions

Professional development is a critical part of education, especially in career and technical education (CTE). CTE programs have rapidly changing technological foundations (U.S. Department of Education, 2012) and the CTE teachers' primary focus is to prepare students for entry-level positions in their occupational areas. The expectation that schools teach a more diverse group of students to much higher standards has created much greater demands on teachers (Linda Darling-Hammond, 2000). As a result, CTE teachers must ensure their own technical knowledge and skills remain current in order to adequately prepare students for technically enhanced work environments, in addition to keeping up on advances in teaching and learning,.

Previous research on CTE professional development focused on agriculture (W. Camp et al., 2006; Joerger, 2003; Lester, 2012; Saucier, McKim, Muller, & Kingman, 2011). Recently research has focused on business education and family and consumer science (Cannon et al., 2012; Kitchel et al., 2012), and high school administrators perceptions of CTE teachers' professional development needs (Cannon, Tenuto, & Kitchel, 2013). No research has been done on the perceived needs of Oregon I & E teachers.

In order to make professional development meaningful to I & E teachers, Knowles (1980) wrote that in adults, readiness to learn is dependent on an appreciation of the relevancy of the topic. As Knowles stated, adult learners tend to become ready to learn things that they believe are important (1980). Determining what the individual needs to learn so as to achieve their goals is the first step in the adult learning process. The identification of priorities for professional development of I & E teachers focuses on the theory on what is most important to I & E teachers. Adult learning theory suggests that the adult learner has a higher level of motivation to learn

when there is a perceived need. When seeking to identify priorities for professional development, teachers are an important source of data (Kitchel et al., 2012; Knowles, 1980).

Summary of Findings

This chapter presents a discussion of the findings regarding the perceived professional development needs of Oregon I & E teachers. Electronic surveys containing 35 professional development competencies were sent to 193 I & E high school teachers in Oregon. One hundred and twelve completed the survey for a response rate of 58%. The Borich Needs Assessment Model was used to calculate the participants' perceived importance and competence of the 35 professional development areas. Knowles et al., (2005) states that the adult learner is ready to learn when the learning is relevant to everyday life. The needs assessment allows the instructors to rate their own perceived professional development needs.

This study serves as a snapshot that depicts the thinking of I & E teachers toward professional development. The findings of the study can be used to enhance professional development activities, thus strengthening Oregon I & E teachers' competency levels. The current federal policy for CTE reflects the belief that increasing teacher quality through effective preparation and professional development is important to improving the academic and technical achievement of CTE students (National Research Center for Career and Technical Education, 2010). This becomes even more critical now that the Perkins IV links funding to student outcomes. Students must be prepared to demonstrate proficiency on technical assessments covering industry-recognized standards.

Organized by possible conclusions gained from data analysis, this discussion explores the insights that have emerged from such analysis, as well as the implications for practice. The chapter concludes with recommendations for future study. This study was guided by three

research questions: (a) what are Oregon I & E teachers' perceived importance of specific areas of their professional development, (b) what are Oregon I & E teachers' perceived competence in specific areas of professional development, and (c) what are the perceived professional development needs of Oregon I & E teachers?

An Aging Workforce with Gaps in the CTE Teacher Education Pipeline

Data from this study indicates that the Oregon I & E workforce is an older one with an average age of 48.5. According to the National Center for Education Statistics (2012), this is older than the overall average of 43.5 years for all Oregon teachers. This finding is consistent with studies such as Cannon et al. (2010) who found that teachers age 45 to 54 ($n = 33$, 30.3%) and 55 to 64 ($n = 33$, 30.3%) made up the largest age groups of Idaho skilled and technical science teachers in their study. Kitchel et al., (2013) reported that the majority of the family and consumer teachers in Idaho were in the age range of 45 to 65 ($n = 64$, 71.1%) and Saucier (2010) reported that of those who responded to his survey of Missouri agriculture teachers, 41.3% were over the age of 40. This study also found 38% of the Oregon I & E respondents indicated they had entered teaching through an alternative method, which is consistent with findings by Cannon et al., (2010) who reported "a large majority of teachers received training through the Idaho occupational certification process ($n = 81$, $f = 74.3$), while a little more than 50% of the teachers received teacher training through a traditional undergraduate degree program ($n = 56$, $f = 51.4$)" (p. 52). The lack of an organized CTE teacher pipeline combined with the large number of Oregon I & E teachers who are close to retirement is an issue that must be addressed.

The number of teachers needed to fill K-12 public school classrooms is substantial and growing. Darling-Hammond (2000), Hussar (1999), and others have projected that well over 2.5 million new K-12 teachers are needed because of retirement and turnover. The 2000 – 2001

edition of the U.S. Department of labor *Occupational Outlook Handbook* states that CTE teaching positions would grow 9% from 2012 to 2022 (Bureau of Labor Statistics, 2012). Bruening et al. (2001) confirmed a decline in the capacity to produce CTE teachers that represents at least a 10% decrease between 1991 and 2001. With the decline in CTE teacher education programs (Bartlett, 2002; Bruening & Scanlon, 2001; DeWitt, 2010; Ruhland & Bremer, 2003b), alternative certification programs have become the norm, not the exception.

Faced with a growing number of retirements and the lack of CTE teacher education programs, Oregon school districts are turning more and more to industry for their I & E teachers. In Oregon, potential CTE teachers must have a minimum of 1,800 hours of industry work experience in the content area they wish to teach. Oregon Labor Commissioner Brad Avakian, reported at a town hall meeting on July 15, 2014 that the average age of Oregon's skilled labor force was 52. Commissioner Avakian predicts a shortage in skilled workers that will raise the salary and benefits of the entering skilled workforce. These statements are backed by the state profile of Oregon by Boston College that reported Oregon's workforce has about 337,500 workers ages 55 and older (The Center on Aging and Work, 2008). Right behind this group of workers are the approximately 351,000 younger baby boomer workers between the ages of 45 and 54 (Beleichiks & Krumenaur, 2014). But as Lewis (2001) indicated, potential CTE teachers from industry can make more money working in business or industry than they can make as teachers.

The majority of CTE programs such as business education, technology education, agriculture education, family and consumer sciences, and marketing/distribution education still use the traditional four-year baccalaureate model similar to the model used by elementary, middle and high school teachers. Although most of these teachers do have some occupational

experience, in most states it is not a requirement for teacher licensure (Gray & Walter, 2001). I & E content areas typically use an alternative preparation/certification model that stresses work experience over educational degrees. Gray and Walter (2001) reported that I & E teachers "typically have at least an associate degree, and twice as much work experience related to their teaching assignment (15 years) as other vocational teachers (8 years) and three times as much as academic teachers (6 years)" (p. 3).

Oregon is not the only state without a CTE teacher education pipeline. The literature clearly shows a decline nationally in CTE teacher education programs. Camp and Heath-Camp (2007) attributed the decline of CTE teacher education programs to the No Child Left Behind (NCLB) Act and to a 1983 government issued report titled "A Nation At Risk" (National Commission on Excellence in Education, 1983). Due in part to high stakes testing, CTE enrollments declined at the secondary level. At the same time there was a shift in federal funding for CTE programs beginning with Perkins II in 1990 (Camp & Health-Camp, 2007). At that time, the Perkins funds that were set aside for state-level leadership, with much of that money being used to support teacher education efforts in CTE, was redirected to local schools. "The decline in secondary CTE enrolment coupled with the changes in funding patterns in Perkins II created a situation: CTE teacher education programs rapidly withered across the country" (Camp & Heath-Camp, 2007, p. 18).

Rojewski (2002) posited that, "teacher preparation curricula need to equip pre-service teachers with the tools and experiences necessary to integrate academic and vocational education, prepare students for entry into the workforce, and support the successful transition of students from high school to two-year or four-year postsecondary education" (p. 31). Teacher education programs must prepare emerging educators to: (a) address the long-term prospects of

students not just entry-level jobs, (b) encourage high levels of academic proficiency and mastery of complex work-based knowledge and skill, and (c) preserve the full range of post-secondary options for program participants (Rojewski, 2002). Oregon's alternative route to teaching offers little support for new CTE teachers, and does not address the above recommendations.

Many studies have been conducted on the difference between alternatively and traditionally certified teachers. Darling-Hammond, Chung, and Frelow (2002) reported that teachers who completed traditional teacher preparation programs reported feeling better prepared to teach than those who completed alternative programs. Shen (1997) reported that alternatively certified teachers appeared to have lover academic qualifications than traditionally certified teachers. Laczko-Kerr and Berliner (2002) found that students of traditionally trained teachers performed significantly better in reading, math, and language arts. Independent t-tests confirmed that there is no difference between the two groups of teachers in this study in terms of perceived professional development needs.

If 60.7% of the Oregon I & E workforce is within retirement age, and CTE teacher education is nonexistent, the quality of instruction in CTE programs will decline and the skills students are to learn for mid-level jobs will also decline. Potential and existing teachers will not have the opportunity to receive the education they need to become qualified teachers and to stay qualified. "Should this happen, our CTE students, and possibly our nation's economy, will suffer the consequences" (Camp & Heath-Camp, 2007, p. 19).

A Conflict in Competing Perspectives of Professional Development

By comparing the results from this study with the national data, the perceptions of what is important from those creating policy and setting priorities for professional development at the state and national level are very different from those CTE teachers in the field. The highest rated

perceived professional development needs by Oregon I & E teachers were "Grant writing and funding opportunities" (*MWDS* = 2.84) followed by "Motivating students to learn" (*MWDS* = 2.42), "Developing curriculum-based School-to-Work and/or School-to-Career activities" (*MWDS* = 2.42), and "Business and educational partnerships" (*MWDS* = 2.38). Similar results were found by Cannon et al., (2012) when they studied the perceived professional development needs of Idaho CTE teachers. "Grant writing and funding opportunities" and "Motivating students to learn" were identified as the top perceived needs of Idaho CTE teachers in a study of secondary principals perceived professional development needs of CTE teachers by Cannon et al., (2013).

The results of teacher and administrator surveys do not reflect the national trend in CTE professional development. Two national surveys of national and state leaders indicated "Integration of academics," at the top of their regional and national priority list (ACTE, 2013; Wichowski & Arnold, 2011). Oregon I & E teachers ranked integration of academics quite low in this survey. "Math in CTE" was ranked twenty-fifth (*MWDS* = 0.62, *n* = 102) and "Literacy in CTE" was ranked twenty-sixth (*MWDS* = 0.47, *n* = 95) by the participants in the study.

The State of Oregon has been actively engaged in the promotion of CTE curriculum integration over the past decade. The Oregon Applied Academics Project began in 2006, with the initial implementation of the Math in CTE model. The Math in CTE model was developed and tested as an intervention for CTE teachers (Pearson, Richardson, & Sawyer, 2013). As partners in the professional development sessions, the math teachers learned new, authentic applications of mathematics. The Math in CTE model was CTE driven, addressing the math required in the CTE context (Pearson et al., 2013). For the "Importance" rankings, "Math in CTE" was ranked eighth (*M* = 4.04, *SD* = 0.76) among the "importance" rankings and for "Literacy in CTE," the

ranking was tenth ($M = 4.05$, $SD = 0.72$). The "Ability" rankings were similar with "Math in

CTE" ranked eighth ($M = 3.83$, $SD = 0.93$), and "Literacy in CTE" ranked tenth ($M = 3.90$, $SD =$

0.86). These results imply that Oregon I & E teachers see the value in the integration of

academics into their programs, and they feel confident in their ability to do so. Often, input from

teachers is not sought as policymakers have come to believe that teachers are a part of a system

that needs to be fixed rather than key contributors to the reform agenda (Bartell, 2001).

Many interests are at stake in the public education system, and these interests are often in

conflict with one another. Bartell (2001) points out that these interests become the

"underpinning of the politics of education and involve a complex interrelationship between

politicians, private foundations and think tanks, teachers' unions, special interest groups,

educational politicians, school administrators, boards of education, courts and the knowledge

(publishing and testing) industry" (p. 194). Teachers are frequently the targets of reform, but

they exert relatively little control over professional development. Fuhrman & Fuhrman (1993)

argues that there are three characteristics of our political system that contributes to policy

making. These are, the focus on elections, policy overload, and specialization. "The emphasis

placed on campaigning and elections over policy or instructional improvement has led state and

federal legislators to seek legislation with name recognition, to circumvent controversial issues,

and to favor policies with immediate effects and clear benefits over those with longer term and

more remote benefits" (Bartell, 2001, p. 190). State leaders are sponsoring more important

educational initiatives than in the past, tempting them to pay less attention to each aspect of

policy (Bartell, 2001; Sykes, 1996).

The primary purpose of professional development is to provide educators the essential

knowledge, skills, and technical information required for them to effectively carry out their

professional duties and meet the demands of a changing educational environment (Barrick, Ladewig, & Hedges, 1983; Saucier et al., 2011; Washburn, King, Garton, & Habstreit, 2001). To make the professional development meaningful to I & E teachers, Knowles (1980) suggests that in adults, readiness to learn is dependent on an appreciation of the relevancy of the topic. Fullan and Stiegelbaur (1991) reviewed the related research and summarized that professional development efforts fail because: (a) of an extensive use of one-shot workshops; (b) topics selected by nonparticipants; (c) lack of follow-up; (d) lack of thorough evaluation; (e) factors within the schools not being addressed; and (f) an absence of a conceptual basis for program planning and implementation. Teachers want to have the ability to choose where to invest their time to learn what they need to teach better. Administrators want to build a critical and coordinated approach to improving instruction and measures of assessment building wide. Policy makers will write law that requires specific outcomes, and professional development will become focused on the outcomes of students.

In general, I & E teachers perceived themselves more competent in the areas they believed were most important. However, for all 35 professional development items, I & E teachers rated their ability lower than they rated the item's importance. This indicates that more training in all areas would improve the overall quality of the Oregon I & E teacher workforce. It also seems to indicate that I & E teachers are willing to attend professional development. Some of the biggest barriers for teachers to attend professional development is support (Gano-Phillips et al., 2011; Penuel, Fishman, Gallagher, Korbak, & Lopez-Prado, 2008; Ruhland & Bremer, 2003a).

Oregon I & E teachers recognize the need to effectively prepare students to enter the workforce and/or post-secondary education. In this study, three of the top 10 perceived

professional development needs included "Developing curriculum-based School-to-Work and/or School-to-Career activities" (*MWDS* = 2.42), "Providing guidance and career exploration activities to students" (*MWDS* = 2.27), and "Student employability skills programs" (*MWDS* = 2.19). These results may be related to state and federal legislation requirements as CTE programs in Oregon must prepare students for high wage, high demand occupations.

Sustainability of Programs

The findings of this study make it clear that Oregon CTE teachers have an interest in pursuing other funding sources. "Grant writing and funding opportunities" had the highest mean weight discrepancy score (*MWDS* = 2.84), and three other perceived professional development needs, "Business and educational partnerships" (*MWDS* =2.38), "Understanding federal (Perkins), state and local funding" (*MWDS* = 2.23), and "Developing an effective public relations program" (*MWDS* = 1.85), are also related to this need. A perceived need for training related to grant writing and funding opportunities should raise concerns about the viability and sustainability of CTE programs at the secondary level.

Oregon educational programs, and CTE programs in particular, have faced declining financial support from public funding. Oregon has struggled with funding public education since Measure 5 passed in 1990. Measure 5 was an amendment to the Oregon constitution that established limits on Oregon's property taxes and real estate. Property taxes dedicated for school funding were capped at $15 per $1,000 of real market value per year and gradually lowered to $5 per $1,000 per year. The property tax limitations enacted under Measure 5 shifted the primary burden of paying for K–12 education from local property tax payers to the state general fund. That shift led the Legislature in 1991 to establish a school funding equalization formula. That funding formula, largely based on student enrollment numbers and student demographics,

determines how much money each school district will get from the State School Fund to fill the gap between the district's local revenue and its equalization target under the formula.

In the 1990s, as Measure 5 was phased in, more of the state general fund went to pay for education. However, in recent years, funding for secondary and post-secondary education has been squeezed, both as the result of general budget cuts during the recession and also as the costs of state corrections and social services grow. During the 2011-2012 school year Oregon spent 7% less per student in public schools than the nation as a whole (U.S. Census, 2012).

While state funding has diminished over the years, Oregon has also seen a decline in federal funding as well. Oregon CTE programs rely on federal funding through the Carl Perkins Act. Since 2003, nationally CTE Perkins funding has experienced an overall decline in funding of approximately $188 million (NASDCTE, 2014). Between 2010 and 2013, Oregon's allocation of the Perkins funds was reduced by $2 million (ACTE, 2013).

In recent years, Oregon has increased its funding of CTE through special grants. At the time this survey was being launched, the Oregon Department of Education had just announced the 32 recipients of the CTE Revitalization Grant, a competitive grant allocating $8.87 million to revitalize CTE programs in middle and high schools around the state during the 2013-2015 biennium. Of those school districts that submitted successful proposals, 21% ($n = 4$) were written by teachers, 27% ($n = 5$) were written by administrators that are not usually seen as the district grant writer, and 26% ($n = 5$) were written by a combination of teacher, administrator and CTE regional coordinator (Oregon Department of Education, 2014a).

The Oregon State Legislature has recently recommended a focus on Career and Technical Student Organizations (CTSO) and science, technology, engineering, and mathematics (STEM). These priorities were supported by making awards of at least $1.0 million for competitive

grants that involve CTSOs and $1.0 million for competitive grants that have a clear tie-in to STEM. Findings from this study, and the recent actions of the Oregon State Legislature, seem to indicate that Oregon I & E teachers and state leaders are looking for ways to sustain their CTE programs through the identification of outside funding opportunities.   With all the grants being made available to CTE programs, is no surprise that CTE teachers would want to learn more about grant writing.

Implications for Practice

The results of this study provide information for policymakers and educators as they consider and plan professional development activities for I & E teachers. I & E teachers generally perceive themselves more competent in the areas they believed were most important. However, for all 35 professional development areas, I & E teachers rated their ability lower than they rated the item's importance. This indicates that more training in all areas would improve the overall quality of the Oregon I & E teacher workforce. It also seems to indicate that I & E teachers are willing to attend professional development. The findings of this study should be used as an element in the professional development planning process, involving CTE educators, district administrators, and state and local industries.

The top in-service priority, "Grant writing and funding opportunities," demonstrates the desire by I & E teachers to seek outside funding sources. As education funding continues to diminish at the state and local levels, educators know that to sustain the programs they currently have, they must find other funding sources. Those involved with professional development should implement activities which will help secondary teachers to effectively write grant proposals.

This study also indicates "Teaching students to think critically and creatively" and "Motivating students to learn" are two of the top rated in-service needs for importance and competence. Critical and creative thinking skills are needed by students as they prepare for entry into the workforce and or higher education. Decision making skills are improved by critical and creative thinking. Motivation is also an important aspect of student learning (Hunter, 1995). Motivation, one of the foremost problems in education, is often inadequately addressed in typical foundational (educational psychology) courses (Ames, 1990). Ames (1990) asserts that motivation occurs within a context such as the school, an assignment, or problem to solve. Those involved with professional development should implement activities that will help secondary teachers focus on content specific contextual learning activities. Well planned classroom and lab learning experiences lead to a peak in student motivation (Hunter, 1995).

This study also indicates that there is no difference between alternatively and traditionally certified teachers perceived professional development needs. Professional development is a critical part of education, especially in career and technical education (CTE). CTE programs have rapidly changing technological foundations (U.S. Department of Education, 2012) are often taught by teachers with an alternative teaching certificate (Bruening et al., 2001; National Association of State Directors of Career Technical Education Consortium, 2009; Ruhland & Bremer, 2003a), and the CTE teachers' primary focus is to prepare students for entry-level positions in their occupational areas. As a result, all CTE teachers must ensure that their own technical knowledge and skills remain current in order to adequately prepare students for these technically enhanced work environments.

Recommendations for Further Study

The purpose of this study was to assess Oregon secondary I & E teachers' perceptions of importance, competence, and professional development needs. The results of this study provide information for policymakers and educators as they consider future professional development for I & E teachers.

The Oregon I & E workforce is an aged one. Nearly half ($n = 66$, 59.0%) of all respondents in this study were over the age of 50. Teachers with more than 10 years of experience comprised 70% ($n = 89$) of the respondents. Thus the perceived professional development needs are skewed toward the perceptions of the most experienced teachers. Teachers with more experience are generally older, and as Knowles, Holton, and Swanson (2005) have speculated, may have different learning needs than younger adult learners with less experience. Experienced teachers may feel more confident and/or exhibit a stronger self-efficacy (belief in their ability) with individual competency items. Although this study did not examine the differences between beginning and veteran CTE teachers, determining if professional development needs differ for beginning and veteran teachers warrants investigation.

Identifying the specific needs of CTE teachers is an important first step in bridging the gap between knowledge, skills and attitudes, and teacher competency in becoming an effective teacher. A similar study to this one that has a more directed approach of targeting focus areas and skill sets in each career learning area would be invaluable to state and local CTE leaders who are responsible for professional development activities. Furthermore, the differences between the CTE content areas and the professional development needs has not been extensively studied. This study did not examine the differences between content areas within the I & E career learning area. Similar studies target the other five career learning areas in Oregon; agriculture,

food and natural resource systems; arts, information and communications; business and management health sciences; and human resources, may be invaluable to those responsible for developing policy and professional development (Cannon et al., 2012; Kitchel et al., 2012; McKim, 2014; Saucier et al., 2011).

As this study shows, there is a difference in the perceived professional development needs between state and federal policy makers and those who most benefit from the professional development. State and local CTE leaders, principals, and administrators may have different perceptions of CTE professional development, and this difference warrants some investigation. A study of the perceptions of these leaders would give an added dimension in determining the professional development needs of CTE teachers.

When reviewing the results of this study, it is implied that if a professional development item is highly perceived as important, but lacking a high-perceived ability, the item is in need of professional development. Therefore, state and local CTE leaders should focus on offering professional development opportunities for those professional development items with the highest MWDS. The other professional development items need to be reviewed and evaluated to see if they are appropriate to offer professional development opportunities. Follow-up surveys should be conducted in order to determine the effectiveness of any implemented professional development activities to meet the perceived needs.

Limitations

Limitations of this study must be considered in a discussion of the conclusions and recommendations. Although the survey design was appropriate for gathering teachers' perceived needs for professional development, several factors may have limited the results of this study. First, survey research was effective in gathering responses from a large number of participants,

but limited the responses to only those on the survey instrument, with no opportunity to investigate for further details. The researcher did not ask the question, "What do you believe is your most important professional development need?" There is value in asking this question, and future researchers should consider this question when developing professional development needs assessment instruments. Further study is needed to delve more deeply into I & E teachers perceived professional development needs.

A second limitation was the fact that only Oregon I & E teachers who taught in an Oregon approved CTE program of study in the 2013-2014 school year were selected to take the survey. CTE programs in Oregon are only able to access Perkins funds by completing an exhaustive, yet thorough program of study application and teacher licensure process. The fact that the only teachers who completed the program of study application and received the proper license endorsement were asked to participate in the study means the study is limited to the population of industrial and engineering teachers in Oregon who teach in an Oregon approved CTE program of study.

The age of the participants must be considered a limitation. Nearly half of the respondents to this survey were over 50 years old. Teachers with more experience are generally older, and as Knowles, Holton, and Swanson (2005) have speculated, may have different learning needs than younger adult learners with less experience. Experienced teachers may feel more confident and/or exhibit a stronger self-efficacy (belief in their ability) with individual professional development items.

In their decision to rate professional development items according to importance and competency, it was necessary for respondents to make value judgments. The following assumptions were made in conducting this study:

1. The respondents were truthful in all of their responses.

2. The respondents were accurately able to rate their perceived abilities on all competencies listed in this study.

Even though there are limitations, this instrument can serve as a foundational piece for future professional development needs assessments. Further modifications are welcomed in crafting a tool that effectively and efficiently provides information to those involved with professional development planning whether at the state or local level.

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Appendices

Appendix A

Number of Industrial and Engineering Programs by Content area 2013-2014

Automotive and Heavy Equipment Repair	21
Engineering Drafting	24
Construction	48
Engineering	28
Information and Communications Technology	15
Manufacturing	57
Total	193

Appendix B

Survey Instrument

By completing the questionnaire, you agree that "I have read and understand the informed Consent Form for Research. I agree to participate in this study with the understanding that I may choose not to participate or to stop participating at any time without penalty or loss of benefits to which I am otherwise entitled."

- ○ I agree
- ○ I do not agree

-

 If **I do not agree** Is **Selected**, Then Skip To **End of**   **Skip** **Survey**   **Logic**

Page Break
Q2
☐
Please select the type of teacher preparation program you completed to become an Industrial & Engineering Systems teacher.

Traditional Teacher Preparation Program - Teacher education degree program at a college or university that leads to teacher certification.

Alternative Licensure Program - Program in which teacher completes certification requirements without enrolling in a degree program and applies directly to the Oregon Department of Education for certification. (Post-Baccalaureate Teacher Licensure Programs that do not result in a graduate degree fall into this category.)

- ○ I completed a Traditional Teacher Preparation Program
- ○ I completed an Alternative Licensure Program
- ○ I am currently completing an Alternative Certification Program
- ○ I did not complete a Teacher Preparation Program

Q3
☐
What is your gender?

Male   Female
○   ○

Q4
☐

What is your age? [_____]

Q5
☐
How many years of teaching experience do you have?

1 to 4   5 to 9   10 to 15   16 to 20   20 to 25   More than 26

○   ○   ○   ○   ○   ○

Q6
☐
Which content area best fits what you teach?

- ○ Automotive and Heavy Equipment Repair
- ○ Engineering
- ○ Engineering Drafting
- ○ Construction
- ○ Information and Communications Technology
- ○ Manufacturing

Page Break
☐

The following questions will ask you to score each item in two ways:

1. The IMPORTANCE of each item to your I & E program

2. Your current level of COMPETENCY (ABILITY) for each item

The information will be used to determine both the strengths and current needs of I & E teachers in Oregon

Column Options Importance						Column Options Ability				
Not Important	Low Importance	Somewhat Important	Important	Very Important		Not Competent	Low Competency	Somewhat Competent	Competent	Very Competent
○	○	○	○	○	**Example: Using Industry to Support learning**	○	○	○	○	○
○	○	○	○	○	**Use of Industry Based Certifications**	○	○	○	○	○
○	○	○	○	○	**Common Core State Standards**	○	○	○	○	○
○	○	○	○	○	**Curriculum Development/ Revision**	○	○	○	○	○
○	○	○	○	○	**Cultural, Equity and Diversity Awareness**	○	○	○	○	○

| **Column Options** | | | | | | **Column Options** | | | | |
| Importance | | | | | | Ability | | | | |
Not Important	Low Importance	Somewhat Important	Important	Very Important		Not Competent	Low Competency	Somewhat Competent	Competent	Very Competent
○	○	○	○	○	**CTE Teacher Technical Skill Updating**	○	○	○	○	○
○	○	○	○	○	**Integration of Academic and CTE**	○	○	○	○	○
○	○	○	○	○	**Meeting Learning Styles Needs**	○	○	○	○	○
○	○	○	○	○	**Assessment Rubrics**	○	○	○	○	○
○	○	○	○	○	**Math Programs in CTE**	○	○	○	○	○
Not Important	Low Importance	Somewhat Important	Important	Very Important		Not Competent	Low Competency	Somewhat Competent	Competent	Very Competent
○	○	○	○	○	**Limited English Proficiency CTE Student**	○	○	○	○	○
○	○	○	○	○	**Reading Programs in CTE**	○	○	○	○	○
○	○	○	○	○	**Career Pathways Program Related Needs**	○	○	○	○	○
○	○	○	○	○	**Seamless Curriculum Development**	○	○	○	○	○
○	○	○	○	○	**Use of Distance Learning Technologies**	○	○	○	○	○

| **Column Options** | | | | | | **Column Options** | | | | |
| Importance | | | | | | Ability | | | | |
Not Important	Low Importance	Somewhat Important	Important	Very Important		Not Competent	Low Competency	Somewhat Competent	Competent	Very Competent
○	○	○	○	○	**Career Awareness for CTE Students/ Parents**	○	○	○	○	○
○	○	○	○	○	**Student Recruitment**	○	○	○	○	○
○	○	○	○	○	**Oregon Career Information System**	○	○	○	○	○
○	○	○	○	○	**Business & Educational Partnership**	○	○	○	○	○
○	○	○	○	○	**Contextualization of Instruction**	○	○	○	○	○

Not Important	Low Importance	Somewhat Important	Important	Very Important		Not Competent	Low Competency	Somewhat Competent	Competent	Very Competent
○	○	○	○	○	**Student Employability Skills Programs**	○	○	○	○	○
○	○	○	○	○	**Dual Enrollment and Articulation Programs for CTE Students**	○	○	○	○	○
○	○	○	○	○	**Teaching students to think critically and creatively**	○	○	○	○	○

| **Column Options** | | | | | | **Column Options** | | | | |
| Importance | | | | | | Ability | | | | |
Not Important	Low Importance	Somewhat Important	Important	Very Important		Not Competent	Low Competency	Somewhat Competent	Competent	Very Competent
○	○	○	○	○	**Motivating students to learn**	○	○	○	○	○
○	○	○	○	○	**Design & Develop digital learning experiences**	○	○	○	○	○
○	○	○	○	○	**Design & develop digital age learning assessments**	○	○	○	○	○
○	○	○	○	○	**Utilize website development software**	○	○	○	○	○
○	○	○	○	○	**Grant writing and funding opportunities**	○	○	○	○	○
○	○	○	○	○	**Understanding federal (Perkins), state, and local funding**	○	○	○	○	○
○	○	○	○	○	**Developing an effective public relations program**	○	○	○	○	○

Not Important	Low Importance	Somewhat Important	Important	Very Important		Not Competent	Low Competency	Somewhat Competent	Competent	Very Competent

| | | **Column Options** | | | | | | **Column Options** | | |
| | | Importance | | | | | | Ability | | |
Not Important	Low Importance	Somewhat Important	Important	Very Important		Not Competent	Low Competency	Somewhat Competent	Competent	Very Competent
○	○	○	○	○	**Developing curriculum-based School-to-Work and/or School-to-Career activities**	○	○	○	○	○
○	○	○	○	○	**Providing guidance & career exploration activities to students**	○	○	○	○	○
○	○	○	○	○	**Program related trends and current issues**	○	○	○	○	○
○	○	○	○	○	**Develop and maintain required safety standards (State and Federal/OSHA standards)**	○	○	○	○	○
○	○	○	○	○	**Evaluating a CTE program**	○	○	○	○	○
○	○	○	○	○	**Establishing and using a program advisory committee**	○	○	○	○	○
○	○	○	○	○	**Completing reports for local and state agencies**	○	○	○	○	○

Column Options Importance						**Column Options** Ability				
Not Important	Low Importance	Somewhat Important	Important	Very Important		Not Competent	Low Competency	Somewhat Competent	Competent	Very Competent
○	○	○	○	○	**Other:**	○	○	○	○	○

Appendix C

Initial Contact Email

Dear (teacher)

My name is Dale Moon and I am looking for your input on Industrial and Engineering (I & E) teachers professional development. I am working on my graduate degree from Oregon State University. My study is titled Oregon Industrial and Engineering Teachers' Perceived Professional Development Needs. I wanted to introduce myself and ask for your participation in my study.

Your participation will entail completing an on-line survey questionnaire about your teaching background, teaching preparation, and current professional development needs. The questionnaire should take 10-15 minutes of your time. If you choose to participate, simply follow the link to the questionnaire and begin. If you do not wish to participate in this study, please respond to this email to remove your name for the list.

Link: (Survey)

As a "Thank You" for your time, all participants who complete the survey will be automatically entered into a drawing for one of two $50 Visa Gift Cards. The winners will be notified at the end of the survey via this email address.

Feel free to contact me if you have any questions or concerns regarding the study. Thank you for your consideration and for all the work you do for CTE students!

Sincerely,

Dale Moon

Appendix D

Follow-up Letter

Dear (teacher)

According to my records, you have not yet completed the Industrial and Engineering survey. Just a friendly reminder that to be eligible for one of the two $50 VISA gift cards you must complete the survey. Most participants have completed the survey in under six minutes. Your input is sincerely appreciated.

In case you need it again, the link to the survey can be found here: (Survey)

For questions concerning this survey, please see the original email below.

Thank you!

Dale Moon

Appendix E

Oregon I & E Perceived Level of Importance for Professional Development Areas

	Not Important	Low Importance	Somewhat Important	Important	Very Important	Response Average	Variance	Standard Deviation	Total Responses
Use of industry-based certifications	3.88%	13.59%	28.16%	33.98%	20.39%	3.53	1.17	1.08	103
Common Core State Standards	5.83%	19.42%	33.01%	33.01%	8.74%	3.19	1.08	1.04	103
Curriculum development and revision	1.94%	4.85%	9.71%	52.43%	31.07%	4.06	0.78	0.88	103
Cultural, equity and diversity awareness	1.94%	4.85%	24.27%	48.54%	20.39%	3.81	0.79	0.89	103
CTE teacher technical skill updating	0.99%	0.99%	6.93%	44.55%	46.53%	4.35	0.55	0.74	101
Meeting learning styles needs	0.00%	1.94%	10.68%	50.49%	36.89%	4.22	0.51	0.71	103
Assessment rubrics	1.96%	8.82%	27.45%	47.06%	14.71%	3.64	0.83	0.91	102
Math in CTE	0.00%	2.06%	20.62%	48.45%	28.87%	4.04	0.58	0.76	97
Meeting the needs of limited English proficiency CTE students	0.97%	5.83%	35.92%	39.81%	17.48%	3.67	0.75	0.87	103
Literacy in CTE	0.00%	2.91%	14.56%	57.28%	25.24%	4.05	0.52	0.72	103
Program needs related to career pathways	0.00%	1.98%	4.95%	55.45%	37.62%	4.29	0.43	0.65	101
Seamless curriculum development	1.00%	3.00%	24.00%	48.00%	24.00%	3.91	0.69	0.83	100
Use of distance learning technologies	5.88%	30.39%	32.35%	23.53%	7.84%	2.97	1.1	1.05	102
Career awareness for CTE students and parents	0.97%	1.94%	13.59%	36.89%	46.60%	4.26	0.71	0.84	103
Student recruitment	3.03%	3.03%	11.11%	43.43%	39.39%	4.13	0.89	0.94	99
Oregon Career Information System	7.77%	13.59%	42.72%	32.04%	3.88%	3.11	0.92	0.96	103
Business and educational partnership	1.96%	1.96%	11.76%	37.25%	47.06%	4.25	0.79	0.89	102

Oregon I & E Perceived Level of Importance for Professional Development Areas (continued)

	Not Important	Low Importance	Somewhat Important	Important	Very Important	Response Average	Variance	Standard Deviation	Total Responses
Contextualization of instruction	0.97%	2.91%	15.53%	51.46%	29.13%	4.05	0.65	0.81	103
Student employability skills programs	0.00%	2.97%	8.91%	38.61%	49.50%	4.35	0.59	0.77	101
Dual enrollment and articulation programs for CTE students	1.94%	5.83%	13.59%	37.86%	40.78%	4.1	0.95	0.98	103
Teaching students to think critically and creatively	0.00%	0.00%	1.94%	28.16%	69.90%	4.68	0.26	0.51	103
Motivating students to learn	0.00%	0.00%	3.88%	30.10%	66.02%	4.62	0.32	0.56	103
Design and develop digital learning experiences	3.88%	13.59%	22.33%	45.63%	14.56%	3.53	1.06	1.03	103
Design and develop digital learning assessments	2.91%	19.42%	27.18%	40.78%	9.71%	3.35	0.99	1	103
Utilize website development software	9.90%	24.75%	37.62%	19.80%	7.92%	2.91	1.16	1.08	101
Grant writing and funding opportunities	4.90%	3.92%	22.55%	42.16%	26.47%	3.81	1.06	1.03	102
Understanding federal (Perkins), state, and local funding	2.94%	1.96%	13.73%	41.18%	40.20%	4.14	0.87	0.93	102
Developing an effective public relations program	1.00%	5.00%	18.00%	43.00%	33.00%	4.02	0.81	0.9	100
Developing curriculum-based School-to-Work and/or School-to-Career activities	1.96%	4.90%	17.65%	50.00%	25.49%	3.92	0.81	0.9	102
Providing guidance and career exploration activities to students	0.00%	1.94%	17.48%	48.54%	32.04%	4.11	0.57	0.75	103
Program related trends and current issues	0.00%	2.00%	27.00%	49.00%	22.00%	3.91	0.57	0.75	100
Develop and maintain required safety standards (State and Federal/OSHA	0.98%	2.94%	4.90%	30.39%	60.78%	4.47	0.65	0.8	102
Evaluating a CTE program	1.96%	6.86%	16.67%	54.90%	19.61%	3.83	0.79	0.89	102
Establishing and using a program advisory committee	0.99%	8.91%	21.78%	47.52%	20.79%	3.78	0.83	0.91	101
Completing reports for local and state agencies	14.00%	23.00%	20.00%	36.00%	7.00%	2.99	1.44	1.2	100

Oregon I & E Perceived Level of Importance for Professional Development Areas (continued)

	Not Competent	Low Competency	Somewhat Competent	Competent	Very Competent	Response Average	Standard Deviation	Total Responses
Use of industry-based certifications	3.88%	11.65%	25.24%	30.78%	18.45%	3.58	1.04	103
Common Core State Standards	1.94%	5.83%	31.07%	47.57%	13.59%	3.65	0.86	103
Curriculum development and revision	0%	4.90%	14.71%	50.00%	30.39%	4.06	0.81	102
Cultural, equity and diversity awareness	0%	1.94%	22.33%	48.54%	27.18%	4.01	0.76	103
CTE teacher technical skill updating	1.96%	5.88%	21.57%	45.10%	25.49%	3.86	0.93	102
Meeting learning styles needs	0%	2.91%	17.48%	53.40%	26.21%	4.03	0.75	103
Assessment rubrics	2%	6.00%	32.00%	44.00%	16.00%	3.66	0.89	100
Math in CTE	1.02%	2.04%	30.61%	40.82%	25.51%	3.88	0.85	98
Meeting the needs of limited English proficiency CTE students	4.85%	16.50%	39.81%	27.18%	11.65%	3.24	1.02	103
Literacy in CTE	0%	1.94%	26.21%	47.57%	24.27%	3.94	0.76	103
Program needs related to career pathways	0.99%	4.95%	18.81%	50.50%	24.75%	3.93	0.85	101
Seamless curriculum development	2.00%	5.00%	35.00%	45.00%	13.00%	3.62	0.85	100
Use of distance learning technologies	11.88%	22.77%	30.69%	21.78%	12.87%	3.01	1.2	101
Career awareness for CTE students and parents	2.91%	0.97%	29.13%	40.78%	26.21%	3.86	0.92	103
Student recruitment	1.00%	6.00%	31.00%	45.00%	17.00%	3.71	0.86	100
Oregon Career Information System	11.65%	12.62%	38.83%	23.30%	13.59%	3.15	1.17	103
Business and educational partnership	1.94%	9.71%	28.16%	40.78%	19.42%	3.66	0.97	103

Appendix F

Combined Ratings of Importance, Competence and MWDS

	Importance M	Importance SD	Competence M	Competence SD	MWDS
Use of industry-based certifications	3.53	1.08	3.54	1.10	-0.17
Common Core State Standards	3.19	1.04	3.61	0.93	-1.46
Curriculum development and revision	4.06	0.88	4.02	0.90	-0.04
Cultural, equity and diversity awareness	3.81	0.89	3.96	0.85	-0.78
CTE teacher technical skill updating	4.35	0.74	3.82	1.01	2.11
Meeting learning styles needs	4.22	0.71	3.99	0.85	0.82
Assessment rubrics	3.64	0.91	3.63	0.96	-0.11
Math in CTE	4.04	0.76	3.83	0.93	0.47
Meeting the needs of limited English proficiency CTE students	3.67	0.87	3.22	1.07	1.57
Literacy in CTE	4.05	0.72	3.90	0.86	0.43
Program needs related to career pathways	4.29	0.65	3.89	0.94	1.55

Seamless curriculum development	3.91	0.83	3.59	0.92	1.17
Use of distance learning technologies	2.97	1.05	2.99	1.24	-0.09
Career awareness for CTE students and parents	4.26	0.84	3.83	0.99	1.70
Student recruitment	4.13	0.94	3.67	0.93	1.71
Oregon Career Information System	3.11	0.96	3.12	1.21	-0.12
Business and educational partnership	4.25	0.89	3.63	1.03	2.50
Contextualization of instruction	4.05	0.81	3.71	0.94	1.23
Student employability skills programs	4.35	0.77	3.77	0.95	2.37
Dual enrollment and articulation programs for CTE students	4.10	0.98	3.88	1.06	0.72
Teaching students to think critically and creatively	4.68	0.51	4.18	0.79	2.14
Motivating students to learn	4.62	0.56	4.06	0.80	2.42
Design and develop digital learning experiences	3.53	1.03	3.33	1.16	0.62

Design and develop digital learning assessments	3.35	1.00	3.10	1.09	0.75
Utilize website development software	2.91	1.08	2.72	1.18	0.41
Grant writing and funding opportunities	3.81	1.03	3.05	1.27	2.84
Understanding federal (Perkins), state, and local funding	4.14	0.93	3.56	1.09	2.23
Developing an effective public relations program	4.02	0.90	3.45	1.02	2.15
Developing curriculum-based School-to-Work and/or School-to-Career activities	3.92	0.90	3.26	1.02	2.45
Providing guidance and career exploration activities to students	4.11	0.75	3.52	0.94	2.27
Program related trends and current issues	3.91	0.75	3.56	0.92	1.13
Develop and maintain required safety standards (State and Federal/OSHA standards)	4.47	0.80	4.07	1.00	1.58
Evaluating a CTE program	3.83	0.89	3.61	0.99	0.71

Establishing and using a program advisory committee	3.78	0.91	3.50	1.04	0.91
Completing reports for local and state agencies	2.99	1.20	3.22	1.19	-0.77