A VISION FOR THE FUTURE OF ELECTRICAL APPRENTICESHIP IN WISCONSIN

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Abstract

Apprenticeships have stood the test of time as a form of higher education. The residual effect of this longevity has been a great deal of bureaucracy and regulation. Because of the regulatory process, apprenticeships have been slow to change. Wisconsin apprenticeship programs are losing their ability to be dynamic in the changing field of education due to the seat-time mandates contained within the regulation. Alternatives to time-based instruction including online, hybrid, and competency-based systems are discussed. All of the alternatives explored here are viable options for creating a dynamic and efficient apprenticeship system of the future.
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Chapter One: Introduction

A new vision for the Wisconsin electrical apprenticeship model is needed to re-establish Wisconsin as an industry leader. The apprenticeship system in Wisconsin was the first of its kind in the United States. It was established in 1911 with the passage of the Wisconsin Apprenticeship Law (Informational Subcommittee of the Wisconsin Apprenticeship Advisory Council and the Bureau of Apprenticeship Standards, 2011). After serving the state for over 100 years, the apprenticeship system could use an influx of new ideas to transcend it for the future.

A revised apprenticeship system should be responsive to the changing dynamic in educational technology. Higher education is going through a rapid evolutionary process. In a ten-year period between 2000 and 2010, the number of students enrolled in at least one online class increased from 10% to 32% (Laitinen, 2013). Online and hybrid models allow for more flexibility in scheduling and offer similar outcomes to traditional face-to-face instruction (Laitinen, 2012). The expansion of educational technology into online and hybrid learning is not currently available to electrical apprenticeship programs due to minimum seat-time requirements within the program.

A system that offers more flexibility in scheduling would benefit both the apprentice and the employer. The current system is set up for apprentices to attend an eight-hour class biweekly throughout the school year. The apprentice attends 18 class sessions per academic year and those class sessions are prescheduled with no consideration of the apprentice’s personal schedule or of job demands that the apprentice must address while attending school. Employers often face worker shortages on school days throughout the academic year as multiple apprentices attend school. A flexible system might alleviate some of those issues while allowing apprentices to
complete their academic programing when it is convenient for the apprentice and their employers.

In addition to increased flexibility, the vision for an improved apprenticeship system should include higher levels of efficiency in cost. Higher education costs have increased significantly over the past few decades. After adjustment for inflation, the cost of attending a public institution of higher education rose 34% in a ten-year period between the 2003-2004 school year and the 2013-2014 school year (US Department of Education, National Center for Educational Statistics, 2014). Online and hybrid education could provide a means of increasing cost efficiency for curriculum delivery. Many face-to-face classrooms are limited in enrollment due to the physical limitations of the classroom. Online classes might be able to accommodate more students in an individual class section allowing for larger class sizes without increasing the need for instructors. Hybrid education could be used in a similar manner. One big physical limitation is lab capacity. By dividing the group of students into two sections for hands-on, face-to-face instruction, the two sections would meet at different times. This would allow the overall class size to be larger without exceeding lab facility capacities. The two sections would then be combined for the online portion of the hybrid course. By formatting the class in this manner, the instructor could facilitate more students in the same amount of contact time. The increase in class size would add workload to the instructor, but compensation for increased workload would be more efficient than paying the instructor to run two courses with lower enrollments.

Efficiency in time is also a consideration in an updated apprenticeship model. In the current system, apprentices complete the program after completing all the required coursework and after participating in the program for at least 5 years. Competency-based education could provide an avenue for apprentices to complete the program in less time. Approximately 15% of
participants in competency-based programs across all industries are seeing accelerated completion (Adams, 2016). As apprentices prove their competence in knowledge and/or skill, they could move through the program at increased speed, meeting all the same competencies in less time.

The reduction in time might also contribute to increased cost efficiencies to employers. Many of the employers that participate in the electrical apprenticeship program compensate apprentices for the cost of tuition for the program. In addition, apprentices are paid their normal hourly wage while attending school. Reducing classroom instruction for apprentices that have already met the competencies might reduce the burden of cost to the apprentices and ultimately to the employers.

The electrical construction field will be facing a significant shortage of workers in the near future. Of the electricians on the job in the United States today, 72% of them are 45 years old or older (Adecco, 2016). The apprenticeship system is the only recognized training program available for developing new electricians. The current system lacks the flexibility and adaptability to significantly increase training to meet the needs of the industry. The current program does not consider the skill levels of the people entering the program (Informational Subcommittee of the Wisconsin Apprenticeship Advisory Council and the Bureau of Apprenticeship Standards, 2011). Apprentices entering the program are slated to begin in the first-year curriculum despite having significant skills and knowledge above the first-year level. A competency-based program would allow for dislocated workers in other sectors to quickly re-tool while recognizing their work experience and skill levels upon entry.
Statement of the Problem

The purpose of this study is to discuss a new model for apprenticeship within the electrical construction industry of Wisconsin. The changes outlined here are proposed to meet the needs of a changing educational system and electrical construction industry.

Definition of Terms

The rapid expansion of virtual education in the post-secondary arena has brought about the necessity to define the terms surrounding distance and online learning. Many institutions define these terms differently. The terms “distance education”, “blended learning” and “online learning” are often used synonymously. For the purposes of this study, the terms below will define those aspects of post-secondary education that might differ between institutions.

Online education: A course or training that contains no meetings in which participants are physically located in the same space, rather all course content is delivered through a virtual presence (Online Education, n.d.)

Hybrid education: A course or training in which the normal face-to-face physical presence has been reduced by at least 25% and replaced with virtual content (Hybrid Education, n.d.).

Virtual education: Instruction in a learning environment where teacher and student are separated by time or space, or both, and the teacher provides course content through course management applications, multimedia resources, the Internet, videoconferencing, etc. (Parlakkilic, 2014).
**Competency-based education:** An educational program that determines student progress through the assessment of mastery of competencies (Frank, et al., 2010).

**Seat-time:** The amount of time spent physically in a seat in the classroom (Laitinen, 2013).

**Bureau of Apprenticeship Standards:** the agency within the Wisconsin Department of Workforce Development charged with the oversight responsibilities of Wisconsin’s apprenticeship program (Informational Subcommittee of the Wisconsin Apprenticeship Advisory Council and the Bureau of Apprenticeship Standards, 2011).

**Paid-related Instruction:** Instructional time in which apprentices are compensated by their employers at their regular hourly wage rate. (Informational Subcommittee of the Wisconsin Apprenticeship Advisory Council and the Bureau of Apprenticeship Standards, 2011).

**Significance of the Study**

The implications of this study are significant to all skilled trades apprenticeship programs. Moving away from traditional apprenticeship models must be done with purpose and care to retain quality while being dynamic enough to meet the needs of an evolving industry and educational system. Shifting away from mandated seat-time in recognition of the flexibility that online and hybrid modalities offer is an important concept of this study. Creating higher levels of efficiency in cost and time is critical for the expansion of apprenticeship training that is needed to meet the changing demographics of the industry. There are many stakeholder interests examined in this study. The interests of employers, apprentices, future apprentices and regulators are all affected by the systems in place today and providing a vision for a revised apprenticeship model will serve them all.
Limitations of the Study

All studies have limitations in their approach. The major limitation of this study is the relatively new development of competency-based education. There are a limited number of educational institutions currently offering competency-based programs. Of those institutions, their offerings are relatively new in comparison with more traditional educational models. Because of the limited number of institutions and the age of the programs, the outcomes of the programs are not representative of the overall population of post-secondary programs.

The focus of this study is geared toward electrical apprenticeship in Wisconsin. There is very little data available when it comes to apprenticeship. A limitation of this study is that the focus on alternative means for seat-time replacement is based in another field, the medical field. While the skills-based learning involved in training medical personnel is similar to the skills-based requirements in apprenticeship, there might be significant differences in the student population between the two fields.

This study was conducted through research using the University of Wisconsin-Platteville Karmann Library. The research was conducted between May 16, 2016 and July 8, 2016. The following search terms were used: credit hour, seat time, apprenticeship, virtual education, online education, hybrid education, online security and competency based education.
Chapter Two: Review of Related Literature

The Current Wisconsin Apprenticeship Model

The current model of apprenticeship in Wisconsin includes a requirement for education based on hours that students are physically in attendance. This is referred to as “seat-time.” The State of Wisconsin Statute 106.01(6) (2015-16) is the basis for seat-time requirements in the Wisconsin apprenticeship model (Wis. Admin. Code Chapter 106, 2015-16). This study has important implications for the apprenticeship model when it comes to the use of virtual education and competency-based instruction. The antiquated system of the time-based, credit hour has many drawbacks that stifle innovation and prevent flexibility in when, where, and how education is delivered (Laitinen, 2013). Distance education enrollments show an upward trajectory. In 2010, 32% of students were enrolled in at least one online class compared to less than 10% in 2000 (Laitinen, 2013). The current model of apprenticeship does not reflect the trend because of the limitations of the seat-time requirements. There are several viable options that could provide an alternative to the seat-time requirement, such as distance education, hybrid education, and competency-based education. All of these options rely on means outside of seat-time requirements to meet course and program outcomes.

The Wisconsin apprenticeship system was established by the passing of state statute 106 in June of 1911. In addition to the state statute, there are two administrative rules, DWD 295 and DWD 296, that regulate the apprenticeship system (Wis. Admin. Code chapter DWD 295, May, 2015; Wis. Admin. Code chapter DWD 296, June, 2007). The Department of Workforce Development’s Bureau of Apprenticeship Standards oversees all apprenticeship programs in the state of Wisconsin (Wis. Admin. Code chapter DWD 295, May, 2015). Under
the authority of the bureau, trade-specific state advisory committees determine rules for trade-specific apprenticeships. The advisory committee also plays a pivotal role in the assessment and selection of curriculum. At the local level, local joint apprenticeship and training committees made up of representatives from employers and from labor oversee the local programs under the guidance of the State Advisory Committee and the Bureau of Apprenticeship Standards (Informational Subcommittee of the Wisconsin Apprenticeship Advisory Council and the Bureau of Apprenticeship Standards, 2011).

The Madison Area Joint Apprenticeship and Training Committee, in conjunction with the Bureau of Apprenticeship Standards, has set the minimum at 700 hours of paid-related instructional seat-time. According to Wisconsin State Statute 106.01(6)(b), apprentices must receive 144 hours per year for the first two years of the apprenticeship contract and a minimum of 400 hours over the duration of a program that is longer than two years (Informational Subcommittee of the Wisconsin Apprenticeship Advisory Council and the Bureau of Apprenticeship Standards, 2011). In addition to the bureaucratic rules governing instructional time, the statute also requires the employers of the apprentices to pay the apprentice their normal wages for the duration of the classroom instruction. This adds an additional challenge for finding alternatives to seat-time requirements because a measure of time must be defined for all learning activities to determine monetary compensation.

A precedence for developing alternative means for seat-time has already been established by the Bureau of Apprenticeship Standards. The bureau currently recognizes correspondence and telepresence courses as alternatives. The administrative rules address the need for employers to give apprentices time to work on their studies on the job or pay them to do so at home. Competency-based models of apprenticeship are recognized in Wisconsin (Informational
Subcommittee of the Wisconsin Apprenticeship Advisory Council and the Bureau of Apprenticeship Standards, 2011). The related instruction is still seat-time based, but the progress of the apprentice through the program is based on skill acquisition. The Wisconsin Bureau of Apprenticeship Standards does not currently allow competency-based education to replace the seat-time requirement for related instruction (Informational Subcommittee of the Wisconsin Apprenticeship Advisory Council and the Bureau of Apprenticeship Standards, 2011).

Competency-based education is in line with the competency-based progress system already in use in the state. The recognition of competency-based progress is justification for the expansion of competency-based education to related instruction.

**Defining Competency-Based Education and its Benefits**

One of the biggest challenges for implementing a competency-based education (CBE) system in apprenticeship is a lack of understanding of what competency-based education is. CBE is currently in the infancy stage among higher education institutions and has not yet been adapted for use in skilled trades paid-related instruction. There are several major universities across the US who have shown progressive action through the implementation of CBE. The University of Wisconsin system is one of those institutions with their UW Flexible Option. Experienced professionals at institutions like this one could serve as a good resource during the development of a competency-based apprenticeship program. CBE programs will continue to increase over time (Ordonez, 2014).

The rise of competency-based education and its continued growth is due in-part to its advantages over the traditional system. CBE provides personalized learning, especially for adult learners, by giving credit for prior knowledge and focusing on what students still need to know
The advantage of only teaching what is necessary for mastery is the reduction of time spent in the learning environment. This reduction in time also accounts for lower costs. CBE was a cornerstone of US President Barack Obama’s plan to make college affordable by encouraging innovation and competition (White House Office of the Press Secretary, 2013). Western Governor’s University, an early proponent of CBE, used their low cost and quick pace, in some cases less than two years, to promote their undergraduate degree program (Johnstone & Soares, 2014). In order to understand the growth and how CBE could be used in electrical apprenticeship, a look into how CBE is defined is required.

The terms competency and outcomes are used interchangeably. Klein-Collins (2012), argued that these two terms were very different in nature. Outcomes were the skills, knowledge and abilities that should have been obtained by participating in an educational exercise. Competencies were at a higher level of learning, providing application of skills and knowledge in the context of situation (Klein-Collins, 2012). Frank et al. (2010) set out to create a definition of CBE, as it applied to the medical field. The researchers examined 173 records that contained definitions of CBE and compiled a list of ten key themes. The themes of greatest interest were de-emphasis of time-based training, flexibility of instruction, learner centeredness, and competencies that were derived from societal needs. All of these themes provided resolution for a higher quality learning experience.

There were differing levels of CBE within the institutions providing programing revolving around the CBE platform (Ordonez, 2014). Some institutions, like Western Governor's University (WGU), had a course-based system where students could complete courses based on passing competency assessments for each course. WGU developed a system of recognizing degree progress through the collection of competency units. In an effort to conjoin
with the credit hour system, there was no coincidence that most of WGU’s degree programs required 120 competency units for degree completion (Ordonez, 2014). Other CBE institutions took a much more progressive approach.

Southern New Hampshire University’s College for America was a unique program that was entirely project based (Clerkin and Simon, 2014). There were no classes, no grades, and mastering of content was done through coaching students through a learning project. This model was geared specifically toward working adults and provided accredited undergraduate degrees to those who might have never had access to education without this program. Expanded access to CBE varied between career fields; one large expanding field was in medical training.

The use of CBE programs has grown rapidly in the medical field. This growth was based on creating medical providers that had the actual skills or competencies to apply the knowledge necessary to do their jobs. Society generally prefers having doctors and nurses that know what they are doing, and competency based systems provide physicians with the skills that meet those expectations (Clark, 2011). This augmentation of medial training could be applied to other industries. The link between skill-based learning in the medical field and skills-based training in the electrical industry is easy to make. When CBE practices are coupled with on-the-job training common to apprenticeship, the level of mastery over electrical installations and troubleshooting competencies could be greater than the industry has ever seen before. There are researchers who challenge the assumption that CBE provides a higher degree of training.

Not all students are set up for success in the competency-based educational system (Kerdijk, Snoek, Van Hell, & Cohen-Schotanus, 2013). Students have differing skill sets and CBE might not be the right educational product for all learners. Similar to online learning, CBE learners must be highly motivated and self-directed. They have to have good organization and
time management skills. Wang (2015) indicated that not all students are a fit for the CBE model and students who depend on high levels of extrinsic motivation may perform better in a traditional format. If CBE was going to be implemented into apprenticeship, there might be a need to teach the apprentices the skills they need for success before beginning the program. The higher education system has been around for many decades, while the widespread use of CBE is just in its infancy. Further research and development will continue to guide best practices of CBE.

Successful CBE programs will adopt best practices of those before them. Policies, procedures and best practices for CBE in higher education provide a guide for educators in implementing CBE programs. “Transforming time-based training to a competency-based system will be a daunting task, even if there is acceptance of the theoretical precepts of CBE” (Taber, 2010, p. 691). The fundamental component of any CBE program is the assessment process (Ordonez, 2014). There are recognized means of assessing knowledge before, during, or after a CBE experience. By adopting these styles of assessment from other CBE programs, the assessment process will continue to improve in validity and reliability. Other best practices encompass the development of competencies.

Competencies in CBE must be robust and valid (Johnstone & Soares, 2014). Subject matter experts are key figures in the development of competencies, but they may not be versed in educational practices. Industry experts and academia should work together basing the learning needs of a program on the actual needs of the industry. Apprenticeship is ready for this type of model, due to the nature of its structure. Industry, labor, and academia are already working together in the local apprenticeship committees and at the state advisory committee level.
Arguments Against Competency-Based Education

There are many advantages that CBE could bring to apprenticeship programs, but there are a few arguments against them as well. One argument against CBE programs is that it complicates record keeping. In the current system, apprentices take classes as a cohort and travel through the program in a relatively linear fashion. This makes the recordkeeping simple. The additional record keeping load that CBE would create could be compensated by the expansion of the current electronic records database system. Apprentices are already reporting work hours and classroom attendance through an online reporting system (J. Cook, personal communication, May 4, 2017). Requiring apprentices to complete the additional paperwork and test results for CBE would be a simple extension of the current system. CBE offers the opportunity for students to complete the program in less time. Apprentices who complete program requirements faster would end recordkeeping practices sooner than those in the traditional system and could reduce recordkeeping overall.

Another argument against CBE might be higher variability in course enrollments. Within the current system, planning for course enrollments is simple because the students move as a cohort. If there were 12 students in DC theory last semester, it is safe to assume there will be 12 students in AC theory this semester. CBE allows for students to move throughout the program in a non-linear fashion, making the enrollment projections more difficult. This might be overcome by the fact that new students entering the program might be slotted in the spots that other students have vacated as they advanced. In a five-year period between 2011 and 2016, 19% of
the electrical apprentices who started are no longer in the program (Wisconsin Department of Workforce Development, 2017). Attrition grows as the apprentices move through their experience yielding lower enrollment numbers in the later years of the program. In some cases, the number of apprentices in a section falls below the minimum enrollment numbers for the course. Moving students through the program at a faster pace might reduce low enrollment in the later years of the program which currently are due to attrition. The educational institutions often provide the training at an elevated cost to employers, despite low enrollment. CBE might help to lower overall costs of providing instruction for the apprentice, the employer, and the educational institution.

Employers might argue that apprentices going through a CBE program might have lower competencies than apprentices completing the current system, due to the reduced training time. A well-developed CBE program would include competencies that were created with industry input and measured through assessments. The current system for assessing competency is based on multiple choice exams and on-the-job training reports. The new assessments could be created to measure competency more accurately than multiple choice exams. The assessments might indicate the need for a student to review or repeat aspects of the curriculum that could even increase apprentice competency at completion.

The rapid expansion of CBE has been largely based on theory while the practice of implementing CBE programs is still in its infancy. While CBE seems to have the potential to answer many of the challenges higher education faces today, the results of CBE have remained for the most part unproven (Gallagher, 2014; Sharma, 2014). In a study examining the knowledge acquisition of medical students, Kerdijck et al. (2013) noted no real differences between traditionally-trained students and CBE students. Part of the issue surrounding this
unproven factor is the relative newness of the CBE system. The CBE program under study was in its first year of implementation and as the program continues, outcomes may increase. The study by Kerdijck et al. indicated that the results of CBE are as good as traditional programing which gave CBE credibility as a means of providing instruction.

Apprenticeship wages were outlined by the apprentice contract and regulated by the Bureau of Apprenticeship Standards (Informational Subcommittee of the Wisconsin Apprenticeship Advisory Council and the Bureau of Apprenticeship Standards, 2011). The wages of an apprentice were based on satisfactory progress and time. Employers might argue against CBE because apprentices might complete the program faster, accelerating the date when they must pay their apprentices post-education journey-worker wages. An apprentice that moves through the program at an accelerated rate has more skills to offer the employer because they have expanded their knowledge by moving forward in the program. They are capable of doing more on the job and are likely to be more efficient. Apprentices are also more available for work if they spend less time in face-to-face instruction. Employers see increased production when the apprentices are on the job rather than in the classroom.

Paid-related instruction is another aspect of apprenticeship that is regulated by the Bureau of Apprenticeship Standards. Employers are required to pay apprentices their normal wages during paid-related instruction (Informational Subcommittee of the Wisconsin Apprenticeship Advisory Council and the Bureau of Apprenticeship Standards, 2011). The current system requires employers to pay apprentices for a minimum of 700 total educational hours throughout their apprenticeship. Proponents of apprenticeship might argue that CBE could destabilize paid-related instruction. Apprentices completing the program at an accelerated rate might not receive wages for the entire 700-hour minimum but would be rewarded with journeyworker status and
full-scale wages upon early program completion. Apprentices who complete the program at an accelerated pace would benefit by earning a higher average wage in comparison with the 5-year period of a traditional program. The employers would also benefit by having lower paid-related instruction costs while maintaining a high-quality training program.

**Arguments Against Hybrid and Online Modalities**

One argument against the use of online education in the apprenticeship system is that it is difficult to verify who is doing the work. Joint apprenticeship committees often make the argument that there is no proof that the apprentice is the one who completed the work. This idea was exacerbated in the Madison, Wisconsin area when an apprentice had his wife complete an online OSHA training in his name. The apprentice admitted that his wife did the work and was required to attend an in-person training. The committee also decided not to accept online OSHA training as a means for meeting the program requirements (J. Cook, personal communication, March 23, 2017).

Online course security can be enhanced though many new technologies. One of those is keystroke dynamics or typing biometrics (Araujo, Sucupira, Lizarraga, Ling, & Yabu-Uti, 2005). Keystroke input can be measured and compared against the baseline for each student ensuring that the person typing is the same person throughout a course. Another form of online security is using webcam software to identify the person in front of the computer when that person is logging in to the course site (Trader, 2015). One possible way to overcome security concerns in the online environment is to have the apprentices complete assessments in a face-to-face environment. If students were not completing the online work, it would show up in the assessment process.
Online and hybrid courses have an undefined number of instructional hours due to the structure of the modality. The current apprenticeship system relies upon hours in determining satisfactory progress and completion. Arguments against removing seat-time based requirements might be related to apprentices meeting the competencies of the program. However, there is little evidence to indicate a correlation between seat-time and competency (Laitinen, 2012). In fact, online and hybrid education were shown to have similar outcomes to face-to-face instruction (Means, Toyama, Murphy, Bakia, & Jones, 2010).
Chapter Three: Conclusions and Recommendations

The field of higher education has seen unprecedented change, due to the rapid rise of technology. The credit hour is an industrial age metric used to measure learning based on time and credit accumulation. It is not based on actual learning, nor is it an indicator of knowledge acquisition. Online and hybrid education are bending the definition of the credit hour by removing the in-class time component of the unit. Competency-based education offers another alternative to the time-based system of education being widely used today. Programs that offer flexibility by assessing student skill and knowledge are allowing students to complete degree requirements much faster and cheaper than ever before. Critics argue that the rapid expansion of CBE is unproven, but studies are showing, at minimum, equivalent outcomes to traditional programs.

The apprenticeship model could be transformed by adopting some of these alternatives. The use of online and distance education in apprenticeship will likely see growth. Competency-based education could provide an even better alternative to mandated seat-time. The purpose of the mandate is to provide ample learning time to apprentices. Replacing the learning time with mandated skill sets would provide higher quality apprentices by allowing those whom have requisite knowledge to move through the program at a faster pace.

Modifying the state statute to address the changes in technology and educational modalities will likely be the most difficult aspect of the process. Legislators, Bureau of Apprenticeship staff, employers, and Wisconsin technical college staff will all have to be educated on the benefits of CBE and the online and hybrid modalities. Grassroots efforts starting at the local apprenticeship committees will have to be formed in order to create enough momentum to get the bureaucratic system moving in a direction toward a more dynamic program. A good place to start this initiative would be to gather all the electrical apprenticeship
instructors across the Wisconsin technical college system. This type of gathering is not unprecedented and would provide a means for spreading the word throughout the system.

Another significant challenge is the development of competencies and related assessments. There are many parties that have an interest in determining competencies. With the number of people involved, the process would be cumbersome and would require a substantial time commitment. Those involved would need to be compensated for their work and questions of where the funding would come from and to what level would need to be answered. Funding through a grant or through the technical college system might be an option as apprenticeship training has seen a significant increase in resources through the United States Department of Labor.

Apprenticeship has served Wisconsin well for the last 100 years. It has been the backbone of training in the skilled trades and provides apprentices with an opportunity to earn while they learn. With a few revisions to meet the needs of the industry today, it could serve the state well for many years to come.
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