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Uncertified and Teaching: Industry Professionals in Career and Technical Education Classrooms

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Abstract: Industry professionals are permitted to teach in Michigan's federally funded Career and Technical Education (CTE) secondary programs, before completing a teacher certification program, under the Annual Occupational Authorization (AOA) provision. This study reviews their academic foundations, professional credentials and their pedagogical knowledge and skill levels. Findings include that most AOA teachers possess post-secondary academic credentials and extensive service records in their previous industry careers. The study identified relationships between the age and educational backgrounds of AOA teachers and their use of specific instructional activities and a statistical relationship between their years teaching in the CTE classroom and the degree of collaboration with academic, industry and occupational colleagues. While AOA teachers are confident in their ability to share occupational knowledge and skills, they lack an extensive awareness of authentic assessment strategies. Recommendations include establishing Teacher Mentoring programs, where both academic and occupational peers serve as mentors to AOA teachers.

Keywords: CTE teacher preparation, uncertified teachers, alternative certification

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1 Introduction

Teachers with industry expertise are valued in CTE classrooms. They bring real-life experiences and expectations to help students prepare for entry-level positions in industries where accuracy, proficiency and competency are critical. Miller (1985) states "Teachers are the most important and critical element in vocational education" (p. 81). The Michigan Department of Education (MDE) allows industry professionals the opportunity to teach in federally funded CTE secondary programs under a renewable provision called Annual Occupational Authorization (AOA).

The MDE requirements, as shared in the Teacher Certification Code, are detailed in Rule 390.1165 and includes this option for industry professionals moving into CTE teaching positions: "The annual occupational authorization is valid for teaching those courses in approved programs in which instruction is limited to the occupation specified on the authorization" (Michigan Department of Education, 1996, p. 27). However, the Teacher Certification Code does not dictate specific pedagogy or academic requirements to secure or maintain an AOA. Nor does the Code stipulate requirements regarding professional training related to any aspect of curriculum and/or instruction by the MDE or by hiring school districts. The Code simply outlines AOA hiring parameters that are less stringent than the certification requirements for all other secondary educators.

Industry professionals are recruited into Career and Technical Education (CTE) teaching because of their expertise in their occupational areas. While they may possess industry experience and credentials, the US Department of Education reports that more than 50% of CTE teachers in health sciences and automotive related instructional programs did not complete a traditional or alternative teacher preparation program. The desk research indicates that more than 20% of practicing CTE teachers do not possess a Bachelor's degree. In many high demand/high wage programs, this figure is much larger. Nearly 60% of automotive teachers and over 40% of those teaching in manufacturing programs have not completed an undergraduate program. (U.S. Department of Education-Institute of Education Sciences, 2008a, 2008b).

David Spence, President, -Southern Regional Education Board, stated that professional preparation is among the key characteristics of a highly qualified CTE teacher; one who "comes from a university-based or professional development pathway" (Bottoms and McNall, 2005, p. 1). The Association for Skilled and Technical Sciences (Gaal and Wermes, 2011) established parameters for three levels of highly qualified CTE teachers, the rankings include academic and occupational parameters and practical and theoretical instruction for secondary teaching environments.

Michigan's Teacher Certification Code does not mandate an induction process that includes strategies to prepare AOA teachers to work with exceptional learners. Bersudskaya and Cataldi (2011) report that students on individualized educational plans comprise more than 10% of the class membership. There are also increasing numbers of students with limited-English-proficiency enrolled in secondary CTE classrooms. At present, there is no mechanism in place for Michigan's AOA teachers to learn how to develop effective instructional lessons, activities or assessments to incorporate the needs of these students. Furthermore, there have been no major changes to the AOA sections of the Teacher Certification Code within the past 25 years.

School districts are reluctant to make financial commitments, such as negotiating new contracts with incoming AOA teachers, until student enrollment counts are guaranteed. As a result, many AOA teachers are hired in the last days of summer with little time to learn about their new roles as instructional leaders. Then, they are expected to begin teaching in secondary educational environments that they last experienced first-hand - as adolescents themselves. A Construction Trades teacher reported that uncertified CTE teachers were leaving the profession because "instructors were thrown to the wolves by administration" (McCandless and Sauer, 2010, p. 73). At a minimum, CTE teachers must be prepared to:

- "Design instruction to support development of technical knowledge and skills, the field's underlying academic competencies, social development and workplace readiness;
- Advance student learning through a repertoire of research-based instructional strategies;
- Assess student knowledge and skills to inform students and teachers; and,
- Reflect on and revise their teaching practice, as necessary" (Bottoms and McNall, 2005, p. 14).

The MDE commissioned this study in hopes of gathering information regarding their AOA population. The study describes Michigan's AOA teachers' academic and industry backgrounds and reports on their current levels of pedagogical knowledge and skills related to academic and occupational curriculum, instructional activities and assessment strategies. The results and recommendations might serve as foundations for professional development programs that help to provide industry professionals with the pedagogical fundamentals needed in CTE classrooms.

2 Aims

Prior to developing professional development activities, MDE officials sought to secure information about their AOA teaching population's academic and professional foundations and their levels of pedagogical ability. Thus, the study examines the demographic characteristics of Michigan's uncertified AOA teachers, specifically:

1) Who are the Annual Occupational Authorization teachers in Michigan's secondary Career and Technical Education classrooms? Specifically,
   A) What are their current teaching program/pathway placements and tenure in those capacities?
   B) What is the scope of their education and industry backgrounds and what current professional credentials or certifications do they possess?

2) What pedagogical skills and knowledge do Annual Occupational Authorization teachers possess? Specifically,
   A) How familiar are AOA teachers with state mandated occupational and academic content for secondary students?
   B) What instructional activities and assessment strategies are used in AOA classrooms?

3 Survey Methodology

3.1 Instrumentation

Permission to use a modified version of the Southern Regional Education Board (SREB) - High Schools that Work Assessment: HSTW Teacher Survey was secured. It specifically focuses on gathering information related to curriculum and instruction planning needs, research-based teaching practices and classroom assessment strategies. The Educational Testing Service previously established credible reliability and validity statistics (Young, Cline, King, Jackson, & Timerlake, 2011). However, a limitation of the study is that it uses the responses collected from the survey exclusively to formulate inferences, conclusions and recommendations.

A web-based, Zoomerang survey was created to capture 37 data items within five sections: General Background Demographics, Transitions, Engaging Students in Learning, Curriculum Content, Leadership and Professional Growth. The related sections and individual items are detailed in Table 1.

Table 1: Survey Sections and Related Survey Items

Section	Related Survey Items
General Background Demographics	• What subject or content area have you taught most frequently in the last two years? • Please list your professional credentials, certifications and/or licenses (i.e.,. ASE, CNE, CPC, RN, etc.) that are current and/or updated within the past five (5) years • How many years of practical work experience in your Occupational area (full- and part-time) do you have in total? • Including this year, how many years of teaching experience in a Career & Technical Education classroom (full- and part-time) do you have in total? • Including this year, how many years of teaching experience (full- and part-time) do you have at your present school?
Transitions	• How familiar are you with the content and specific goals of the courses taught in the schools that send students to program? • How often do you meet with teachers who send students to program to discuss expectations, content knowledge and performance standards for students entering your program? • How often do you meet with employers and postsecondary faculty to discuss expectations, content knowledge and performance standards for students graduating from your program? • Thinking of your current seniors, about what percentage do you think have the skills to do well at a four-year or community college? • Thinking of the current seniors in your program, about what percentage would you feel comfortable recommending as highly competent to an employer in their area of specialization?
Engaging Students in Learning	• Approximately how often do you require students in your classes to do the following (a list of 25 classroom activities)? • How often do you use the following assessment technique to determine how well a student can do the following (a list of four (4) classroom activities)? • Do you include the following forms of assessment in students' course grades (a list of 10 forms of assessment)?

Curriculum Content	• I am able to participate in the development of the annual review of my program's CIP Self Review - GAP Analysis investigation. • I am able to design lesson to teach content from my program's CIP segments. • I am able to cover all the content in the CIP segments allocated to your course in the time allocated. • I am able to develop learning activities related to Michigan's Technical Standards. • I am able to develop learning activities related to Michigan's Career & Employability Skills. • I am able to assess student performance related to Michigan's Career & Employability Skills. • The District provides state-of-the-art tools and equipment for our CIP program. • The District provides me with training opportunities to learn to use these state-of-the-art tools and equipment as they are used in industry. • I learned about GAP Analysis and Segmenting from (Please check all that apply – a list of eight options):
Leadership and Professional Growth	• How often do you meet as a member of a team of academic and career/technical teachers to plan joint instructional activities and to take collective responsibility for student learning? • How often do you meet with a group of teachers to examine students' work to determine if it meets state or national standards in your content area? • How often do you meet with other teachers in your department or school to align assignments and agree upon what student work looks like below, at or above grade-level (college- and career-ready-level)?

3.2 Participants

After approval from the university's Human Investigation Committee, the Michigan Department of Education-Office of Professional Preparation emailed a request to 432 practicing AOA teachers. The email contained a direct hyperlink to the survey website. There was no capability to acquire the identities of the participants embedded in any aspect of the data collection process. There was a two-week collection period. A total of 93 potential respondents visited the survey website; of those, 79 (85%) AOA teachers completed the survey; thus, constitute the sample. There were no nonresponse reduction strategies incorporated in the data collection process.

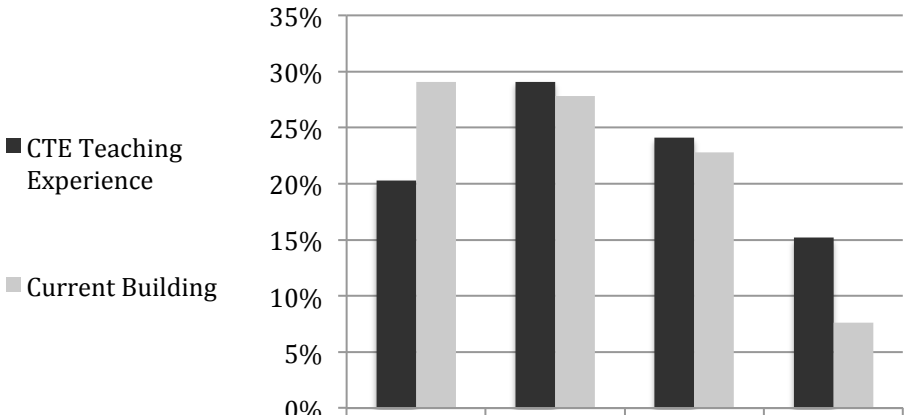
4 Results

4.1 Current AOA teaching placements

Results from the examination of data to address part A of Question One (*What are their current teaching program/pathway placement and tenure in those capacities?)* reflects that nearly 30% of respondents are in the Health Sciences Career Cluster. The Health Sciences area includes programs such as Diagnostic Services, Therapeutic Services, Health Informatics and Biotechnology Medical Sciences. The next largest program areas were: Transportation, Distribution & Logistics (17%) and Manufacturing (10%). Fewer than 10% of respondents indicated Career Clusters: Hospitality & Tourism, Human Services, Information Technology, Agriculture, Arts, Business, Law Enforcement and Science, Technology, Engineering

and Mathematics (STEM). There were no respondents indicating they are in the Career Cluster areas of Education & Training, Finance, Marketing or Business Management and Administration.

Over one half of the respondents possess less than five years of CTE classroom teaching experience. In addition, fewer than 20% have worked in their present CTE facility for more than 10 years. Figure 1 depicts how building level tenure rates decrease over time.



	1 to 2	3 to 5	6 to 10	11 to 15
CTE Teaching Experience	20.30%	29.10%	24.10%	15.20%
Current Building	29.10%	27.80%	22.80%	7.60%

Number of Years

Figure 1: AOA Teaching Experience and Building Tenure Terms

4.2 Industry credentials and academic background

Results for part B of question one (*What is the scope of their education and industry backgrounds and what current professional credentials or certifications do they possess?)* reflect that almost all of the respondents, 93 %, have acquired post-secondary academic degrees as reflected in Table 2.

Table 2: Frequencies and Percentages of Highest Academic Degree

Academic Credentials	Count	Percentage
Business/technical school certificate	6	7.6
Associate degree (two years or more)	16	20.3
Bachelor's degree	30	38.0
Master's degree	18	22.8
Education specialist or a professional diploma (based on at least one year's work past the master's degree level)	1	1.3
Doctorate or professional degree (e.g., Ph.D., Ed.D., LL.B., J.D., M.D., etc.)	2	2.5
Not Reported	1	1.3

On the current study survey, the related question appears as: *Please list your professional credentials, certifications and/or licenses that are current and/or updated*

within the past five (5) years. Table 3 provides an overview of the industry certifications provided by respondents. As the list reflects, they possess credentials from a broad range of occupational areas including automotive, information technology and health sciences.

Table 3: Professional Credentials, Certifications and/or Licenses

Industry Credentials Possessed by AOA Respondents
American Welding Society Certification Automotive Service Excellence (ASE Certifications) • Master Collision Technician • Certified in Automotive Brakes • Master Welding • Master Auto • Master Heavy Truck • Master Engine Machine • Master School Bus • Auto-body Specialist Registered Nurse Certified Dental Assistant Certified Nursing Assistant Information Technology Certifications: • Cisco CCNA, CCAI, CompTIA A+, Linux+, Network+, Server+ Novell CLA Certified Medical Assistant Emergency Medical Technician Commercial Pilot (ASEL, AMEL) Certified Flight Instructor (Instrument) Advanced Ground Instructor Cosmetology License Cosmetology License (Instructor) Servsafe Certification (Culinary)

Nearly 60% of the respondents moved directly from Business & Industry into their CTE classrooms, where 72% have 10 or more years of practical work experience in their occupational fields. Furthermore, only four (5%) of respondents indicated they participated in an alternative teacher preparation program prior to their move into teaching. Little more than 2% of the respondents indicated military service records. There were 14 respondents (18%) who moved directly from postsecondary education into CTE classrooms.

The MDE expects AOA teachers to move towards vocational certification by working to complete the eight requirements for the credential. As Table 4 illustrates, AOA teachers lack a full understanding of the requirements for a vocational certificate. For example, nearly 60%, Table 4 –item b, of respondents indicated that a current annual occupational authorization is required for the vocational certificate. It is not a requirement. In addition, more than 20% , Table 4 item 3, of participants lack awareness of the industry-related work experience requirement for the vocational certificate.

Table 4: AOA Teachers' Awareness of Vocational Certification Requirements

Requirements for Michigan's Vocational Certification	Count	Percentage
1. Bachelor's degree	52	65.8
2. Completion of an approved major, at least 36 credit hours, in a related occupational area	37	46.8
3. Two years (4000 hours) of recent and relevant work experience (within the past 5 years) in the occupational area in which you plan to teach.	61	**77.2**
4. Passing all components of the Michigan Basic Skills test	40	50.6
5. Passing all components of the Michigan Test for Teacher Certification in the Occupational Area (if available).	26	32.9
6. Current First Aid & CPR Certification (Adult and Child)	46	58.2
7. Criminal History Check via IChat within the past six months.	41	51.9
8. Six credit hours of teaching methodology courses in Career & Technical Education taken at the university level	36	45.6
Listed as an option on the survey but are not requirements for vocational certification		
Professional Development workshops where CEUs are earned	38	48.1
A Current Annual Occupational Authorization	47	**59.5**

4.3 Pedagogical Skills and Knowledge

4.3.1 Familiarity with academic and occupational content curriculum

The study sought to learn AOA teachers' perceptions related to instructional design and delivery in research question number two, part A: (*How familiar are AOA teachers with the state mandated occupational and academic content for secondary students?*). The data shows that 85% of AOA teachers indicate they are somewhat or very familiar with the content of courses taught in the comprehensive secondary schools that send students to their CTE programs. However, over 50% of respondents reveal they never meet with academic teachers regarding expectations, academic content knowledge and performance standards. Furthermore, AOA teachers do not collaborate with academic teachers to integrate CTE lessons and assignments with an emphasis on academic content to any great extent. Table 5 shares their responses to the question: *How often do you require students in your class to do the following*?

Table 5: Examples of Collaborative Integration of Academics Assignments not used by AOA Teachers

Academic Integration Strategy Used	Count	Mean	SD
Hold students to academic content standards in writing assignments set by the English/language arts department.	78	2.69	1.453
Joint mathematics assignment for you and a mathematics teacher, for which they received a grade in both classes.	78	1.95	1.376
Joint science assignment for you and a science teacher, for which they received a grade in both classes.	79	1.43	1.070

Note. SD=Standard Deviation
Scale 1-Not at all, 2-Once a year, 3-At least twice a year, 4-Monthly, 5-Weekly

AOA teachers will meet with their CTE peers to examine students' work to determine if it meets state or national industry standards in their content areas. Approximately, 70% of AOA teachers regularly meet, at least a few times within the year, with CTE colleagues. And, 92% of respondents meet, at a minimum annually, with employers and postsecondary faculty to discuss industry expectations, content knowledge and performance standards. While, extremely weak, there is a statistical significance relationship between the years of CTE teaching experience and the level of involvement by AOA teachers in professional collaboration activities with academic and/or CTE colleagues, as illustrated in Table 6.

Table 6: Correlations of Professional Collaboration Activities and Years of CTE Teaching Experience

	r	***R Standard Error***	***t***	***p-value***
I meet with teachers who send students to your program.	**.08773**	.01341	0.75763	0.45108
I meet with employers and postsecondary faculty to discuss expectations, content knowledge and performance standards for students graduating from your program.	**0.19268**	0.01301	1.68914	0.0954
I meet as a member of a team of academic and career/technical teachers to plan joint instructional activities and to take collective responsibility for student learning.	**0.09599**	0.01339	0.8296	0.40943
I meet with a group of teachers to examine students' work to determine if it meets state or national standards in your content area.	**-0.11043**	0.01335	-0.95579	0.34229
I meet with other teachers in your department or school to align assignments and agree upon what student work looks like below, at or above grade-level (college- and career-ready-level).	**0.02159**	0.01351	0.1858	0.85311

Pearson linear correlation was used for the calculations, where N=76 and critical value = 5%.

Overall, AOA teachers believe they are competent in their knowledge and skills related to their occupational content areas. Nearly 90% report they agree or strongly agree with the statements listed in Table 7. Also, when they need assistance with curriculum related issues, more than half seek their co-workers and building administrators to help them understand Michigan's CTE curriculum protocols.

Table 7: AOA Teachers' CTE Content Competencies Rankings (Strongly Agree or Agree)

AOA Teachers' CTE Content Competencies
• I am able to participate in the development of the annual review of my program's Classification of Instruction (CIP) Self Review - GAP Analysis investigation
• I am able to teach content from my program's CIP segments
• I am able to develop learning activities related to Michigan's Technical Standards
• I am able to develop learning activities related to Michigan's Career and Employability Skills
• I am able to assess student performance related to Michigan's Career and Employability Skills

4.3.2 Instructional Activities and Assessment Strategies

Survey responses used to answer part B of question two (*What instructional activities and assessment strategies are used in AOA classrooms?)* support that while many AOA teachers lack the pedagogical knowledge often acquired in a teacher preparation programs, they do attempt to incorporate a variety of student-centered instructional activities in their CTE courses. As depicted in Table 8, the data reflects AOA teachers may use activities that incorporate mathematics and language arts, as well.

Table 8: List of instructional activities and usage levels by AOA Teachers

Instructional Activities Used in AOA Classrooms	MEAN	SD
Complete assignments using the vocabulary associated with the subject area being taught.	4.51	1.266
Use mathematics to complete assignments.	4.42	.876
Work in cooperative groups to deepen understanding of content.	4.23	1.120
Read an assigned book or article and demonstrate understanding of the content.	4.05	1.176
Demonstrate critical knowledge about technical and related academic competencies used to complete an assignment.	3.99	1.032
Use word processing to complete an assignment or project.	3.81	1.300
Read and interpret technical books and manuals in carrying out assignments.	3.81	1.368
Solve problems and give a clear rationale for the method used to solve them.	3.73	1.199
Collect, organize, synthesize and use information to complete a project.	3.71	1.212
Complete computer-assisted research/assignments.	3.70	1.222
Work on open-ended problems for which there is no immediately obvi-	3.51	1.344

ous method of solution.		
Complete writing assignments typical of the type of writing associated with the subject (e.g., reports, technical manuals, descriptive writing, summaries, etc.).	3.49	1.266
Work on an extended, major project that lasts one week or more.	3.42	1.057
Stand before class to make an oral presentation on a project or assignment to meet specific requirements.	3.35	1.241
Use scientific inquiry methods to solve problems related to their career/technical field of study or work setting.	3.35	1.424
Revise essays or written work several times to improve quality.	3.25	1.319
Complete a written report and explain verbally what the student has done and why.	3.18	1.295
Use a journal to write about things they learned.	3.16	1.757
Develop and analyze tables, charts and graphs in schoolwork.	3.15	1.310
Write and prepare business or technical documents and service reports.	2.62	1.424
Design a research investigation, implement it and prepare a written report that summarizes and interprets their findings.	2.19	1.039

Note. SD=Standard Deviation / N=79
Scale 1-Not at all, 2-Once a year, 3-At least twice a year, 4-Monthly, 5-Weekly

Linear regression models were calculated to predict the use of an instructional activity based upon the AOA teachers' age and educational background. There is a statistically significant relationship between the age of the AOA teacher and their use of two (2) instructional activities in the CTE classroom. Detailed results for age and all 20 instructional activities are located in Figure 2.

Regression Statistics

R	0.58533						
R Square	0.34261	**ANOVA**	d.f.	SS	MS	F	p-level
Adjusted R Square	0.03325	Regression	24.	46.9193	1.95497	1.10747	0.3694
S	1.32863	Resicual	51.	90.02807	1.76526		
Total number of observations	76.00	Total	75.	136.9473			

	Coefficients	***Standard Error***	***tStat***	***p-level***
Intercept	-0.66799	2.13507	-0.31286	0.75566
Use background and prior knowledge at the beginning of lessons to learn new content.	0.53406	0.22809	2.34141	0.02316
Complete computer-assisted research/ assignments.	0.33974	0.14637	2.321	0.02432

Note. Significance at $p < .05$.

Figure 2: Age related statistically significant instructional activities

There is a statistically significant relationship between the educational background of the AOA teacher and the probability of their use of three (3) instructional activities. Detailed results for educational background and all 20 instructional activities are located in Figure 3.

Regression Statistics							
R	0.74846						
R Square	0.56019	**ANOVA**	d.f.	SS	MS	F	p-level
Adjusted R Square	0.35323	Regression	24.	48.19886	2.00829	2.70668	0.00142
S	0.86138	Resicual	51.	37.84061	0.74197		
Total number of observations	76.00	Total	75.	86.03947			

	Coefficients	***Standard Error***	***tStat***	***p-level***
Intercept	1.99528	1.38421	1.44145	0.15557
Read an asigned book or article and demonstrate understanding of the content.	0.23667	0.10543	2.24478	0.02915
Develop and analyze tables, charts and Graphs in schoolworks.	0.30032	0.10982	2.73473	0.00856
Hold students to academic content standards In writing assignments set by the English Language arts department.	0.18504	0.08797	2.10357	0.04037

Note. Significance at $p < .05$.

Figure 3: Educational background related statistically significant instructional activities

Approximately, 75% of AOA teachers require students to submit a written report and verbally explain what was done and why, at a minimum of once or twice a semester. In addition, almost 90% of AOA teachers require students to demonstrate critical knowledge about technical and related academic competencies on their assignment submissions.

Respondents use teacher-made multiple choice, true/false tests and use standardized tests produced outside of their schools as evaluation components for final grades. Respondents factor attendance and homework in calculations to determine student achievement levels at the end of the CTE course. They use student attendance in final grade calculation, as well. Furthermore, nearly all AOA teachers include projects and practical/laboratory exercises for final grade calculations. Table 9 provides information regarding assessments used to calculate final grades in the respondents' courses.

Table 9: Assessments used to calculate final grades in the AOA classroom

Assessment Strategy	Count	Percentage
Projects or practical/laboratory exercises	77	98.7
Participation in classroom or laboratory activities	72	91.1
Teacher-made objective tests (multiple choice, true-false)	58	74.4
Attendance	54	69.2
Homework assignments	54	69.2
Portfolio of student work	50	64.9
End-of-course exam in your content area that is used school-wide.	49	63.6
Standardized tests produced outside the school	39	50.0

5 Discussion

5.1 Who are the Annual Occupational Authorization teachers in Michigan's secondary Career and Technical Education classrooms?

Michigan has been successful in securing industry experts to fill AOA teaching positions. Nearly 60% of respondents come to the CTE classroom with more than 15 years of industry related experiences in Health, Transportation and Manufacturing. Teachers in occupational areas related to Education & Training, Finance, Marketing or Business Management and Administration were not participants in the study. These CTE teachers most often move from industry positions, where Bachelor's degrees are required, directly into post-secondary secondary and/or vocational certification programs. They rarely teach under AOA provisions.

Over 65% of the study respondents possess post-secondary academic credentials. A major hurdle for uncertified CTE teachers is that they lack a postsecondary degree. The majority of study respondents do possess postsecondary foundations, at the Bachelor's degree or above. Jacques and Potemski (2014) reports that when state requirements for vocational certification include a bachelor's degree many CTE programs suffer because of teacher shortages.

The American Federation of Teachers (AFT) found that CTE teachers are well educated. Almost 50% of the AFT respondents possess a Bachelor's degree in the industry in which they taught and approximately 60% possess one or more industry credentials and/or licensures (AFT, 2014). In addition, Duncan, Cannon, and Kitchel (2013) reported 50% of the candidates for their alternative vocational certification program possessed a Bachelor's degree. However, our results do not mirror the national picture, where 98% of CTE teachers possess post-secondary credentials (U.S. Department of Education-Institute of Education Sciences, 2008b). Additionally, while there has been an on-going national movement to recruit retired military personnel (DANTES, 2015) into CTE teaching positions, less than 3% of responding AOA teachers possess military backgrounds.

Nearly three-quarters of study respondents have been teaching in a CTE classroom less than 10 years. Whereas, nationally for all CTE teachers, uncertified and certified, over 40% have been teaching less than 10 years (U.S. Department of Education-Institute of Education Sciences, 2008a). The MDE requires AOA positions be annually advertised and posted except for those teaching positions where the AOA teacher is on "Credit Track". Credit Track AOA teachers are actively taking courses toward vocational certification by completing a minimum of 3-credit hours of related postsecondary coursework in the previous academic year. However, it should be noted that when an AOA teacher moves to another school district and begins teaching in a related occupational area, the eight-year 'clock' restarts. Credit track requirement may contribute to the building level attrition rates, where less than 30% of respondents have taught in the same building for more than 5 years and fewer than 10% of respondents have been teaching in the same school for more than 15 years.

At present, Michigan only allows AOA teachers eight years to acquire vocational certification. An extension may be granted in certain teacher shortage areas. However, almost 50% of respondents are not fully aware of the MDE requirements for the Vocational Certification. This lack of knowledge may also impact the number of AOA teacher remaining in the profession and future contribute to the teacher attrition and the current CTE teacher shortage rates currently experienced nationwide. Jacques and Potemski (2014) reported a CTE teacher shortage exists in

critical Career Cluster areas in school districts across the nation. Michigan is experiencing similar shortages in numerous CTE program areas (Michigan Department of Education, 2013).

5.2 What pedagogical skills and knowledge do Annual Occupational Authorization teachers possess?

The data reflects AOA teachers currently use activities that incorporate mathematics and language arts on a regular basis. Similar instructional techniques are used in other successful CTE programs (Dubin, 2014). Authentic assessments, such as projects and practical/laboratory exercises are also used extensively in the calculation of grade calculations. However, the participants continue to incorporate traditional assessment strategies (Travis, 1996; Dikli, 2003), such as attendance and standardized tests, in their calculations for final grades, as well.

For CTE teachers, meaningful work experience in a specific area and pedagogical skills are equally important for future success in the classroom. The real-world experience that CTE teachers bring to the classroom and the perspectives they can share can make learning more meaningful and beneficial to students (Jacques and Potemski, 2014, p. 13).

There are statistically significant relationships between the chronological age of the AOA teacher and the use of select instructional activities. More mature AOA teachers incorporate background and prior knowledge into the introduction of lessons containing new content. Younger teachers incorporate more computer-based instructional activities in their lessons. It has been suggested that uncertified teachers "teach as they were taught" (Oleson and Hora, 2012, p. 3) because of their lack of exposure to concepts learned in a professional teacher certification program.

There is a statistically significant relationship between the academic backgrounds of AOA teachers and their use of select instructional activities. The more post-secondary experiences the AOA teacher has had, the more complex the instructional assignments. Also, this group of AOA teachers incorporate English/language arts content standards into the evaluation of written assignment in their CTE courses on a more regular basis.

The AOA teachers in this study engage students by using the principles of Active Learning in their classrooms (Bonwell and Eison, 1991). The type and variety of instructional activities align across the Active Learning spectrum. The respondents appear confident in their levels of industry knowledge and skills. They also are willing to work with their academic and CTE colleagues to influence their effectiveness to help CTE students prepare for the world-of-work and post-secondary educational experiences. There is a statistically significant relationship between their length of service and their level of professional collaboration with their colleagues. Conrad, Watkins, and Wittmaier (2011) found that networking with building colleagues a critical component of new CTE teacher success.

6 Conclusion

A cornerstone of the foundation of vocational education in America is that trade and industry masters lead and guide instruction in the CTE classroom. Two of Prosser's 16 theorems for vocational education address the need and importance for the CTE teacher to be a competent, industry professional. These theorems follow:

> Theorem number 7: "Vocational education will be effective in proportion, as the instructor has had successful experiences in the application of skills and knowledge to the operations and processes he undertakes to teach" (Camp & Hillison, 1984, p. 15), and
>
> Theorem number 11: "The only reliable source of content for specific training in an occupation is in the experiences of masters of that occupation" (Camp & Hillison, 1984, p. 15)

Proper instruction by industry professionals helps to ensure students are properly trained in the occupational areas they pursue. "In today's economy, it's important to note that career and technical education, beginning in secondary programs and continuing through community and technical colleges, is giving students the skills they need for the global workplace or for continuing their educations" (Reese, 2010, p. 25). As an example, CTE teachers with medical training and academic credentials prepare students at North Point School for Science, Technology and Industry are able to accurately acquire vital signs from patients (Hill, 2012).

The majority of Michigan AOA teachers possess post-secondary credentials. Using this as a foundation, the MDE might encourage them to begin moving towards satisfying the requirements for vocational certification. Their work-experience used when hired as an AOA teacher also satisfies the recent/relevant work experience component for the vocational certificate.

In an effort to better serve CTE students, the MDE and hiring school districts may wish to consider implementing a Teacher Mentoring program. The program might include both an academic and CTE mentors for the AOA teacher. Mentoring programs that include both an academic and occupational mentor teacher would provide the AOA teacher with support in multiple teaching areas (O'Connor, 2012). This might further increase professional collaboration activities and continue to provide the AOA teacher with on-going instructional and classroom management support. In addition, Wilson, Wood, Solomonides, Dixon, and Goos (2013) found that mentoring with academic colleagues is a valuable asset for supporting industry professionals who move from industry to academia. Furthermore, mentoring programs help retain CTE teachers, especially those from underrepresented populations (Sims, 2010).

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