Do They Feel Ready? Self-efficacy of Career and Technical Education High School Student

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Abstract

This non-experimental, quantitative study used a correlational research design to determine if a significant, positive relationship existed between students' completion of a series of CTE courses *and* earning industry-recognized credentials and sense of self-efficacy toward employment pursuits. This research was framed within Social Cognitive Career Theory (SCCT). Data analysis consisted of descriptive statistics using the Pearson's *r* for correlational results. A positive correlation was found in students' course-taking with IRCs and the self-efficacy variables of perseverance and performance. An unanticipated finding from the self-efficacy scale found all students exhibited high mean scores across the individual questions. Findings were supported by the literature on the self-efficacy domain of mastery experience in relation to school environment and contextual teaching and learning experiences. Implications of this study include the benefits of mastery experiences in building self-efficacy and the integration of academic and vocational subjects, both of which can increase the transference of skills across disciplines.

Keywords: career and technical education; vocational education; industry-recognized credentials; self-efficacy

Introduction

Educating our youth should take an all-inclusive strategic approach to involve K-12, post-secondary, and labor systems to train students for entry into a career path that can provide a family sustainable wage (Carnevale et al., 2019). The participation in Career and Technical

Education (CTE) programs is conducive to providing mastery experiences which assists a successful transition into the workforce (Bardach et al., 2019; Williams, 2013). Academic, employability, and technical skills serve as the foundation of CTE which has the potential to address the challenges facing education by taking an approach that will provide students the ability to earn a family-sustaining income through the promotion of high school and post-secondary education and recognized, stackable business and industry credentials (Stone, 2017). Additionally, earning industry-recognized credentials can contribute to students' sense of self-efficacy in their learning (Randall et al., 2013).

To address the skills gap that many states are facing in high-skilled workplaces, the new Perkins V Strengthening Career and Technical Education for the 21st Century Act was passed. This Federal Act was designed to support high quality CTE programs that prepare students for 21st century careers and support business and industry skilled employment needs (Hyslop, 2018; Louisiana Career Technical Education Profile, 2019). Under this Act, a CTE concentrator (a student who completes two or more courses within a field of study) should be provided with experiences involving a sequence of rigorous and relevant, integrated coursework (academic and technical) which hone skills needed in pursuit of college or direct entry into the workforce. This includes the opportunity to earn an industry-recognized credential, certificate, or associate degree (Hyslop, 2018).

The state of Louisiana took the challenge for strengthening CTE and providing students with a stronger foundation on which to enter post-secondary or direct entry into the workforce upon graduation very seriously. Through the Louisiana Jump Start initiative launched in 2012, students have a choice of two graduation paths—TOPS University Pathway or the Jump Start TOPS Tech Pathway. Students who choose the Jump Start graduation path are required to earn a minimum of nine Carnegie CTE units in a specific career pathway, as well as attain industry-recognized credentials (IRCs) to graduate from high school. Within the Jump Start pathways, a state focus list of pathways considered high wage/high demand as identified by the Louisiana Workforce Investment Council (WIC) are encouraged as providing the best opportunity for students transitioning from high school to the workforce which would provide a sustainable wage. Students also have opportunities to participate in work-based learning experiences (All Things Jump Start, n.d.). However, in early 2019, the Louisiana Department of Education reported that though the number of students who were graduating with a career diploma and

industry-recognized credentials had increased, the unemployment rates of our youth were still high. The state superintendent expressed concern that many high school graduates still did not have solid post-secondary plans after graduation (White, 2019).

Purpose

In order to understand how to support CTE students' transition from secondary education programs to jobs in fields for which they have prepared, more needs to be known about why students who complete a prescribed series of career and technical education courses (program of study) and who earn industry-recognized credentials as an outcome of completing the series of courses, are not matriculating into jobs for which they have prepared. The researchers of this study sought to gather and analyze the perceptions of high school seniors in the northwest Louisiana region regarding their self-efficacy beliefs in their preparation for future employment.

Research Question

The researchers sought to answer the following question:

Is completion of a series of CTE courses and earning industry-recognized credentials positively correlated with students' sense of self-efficacy?

H_0: There is either no correlation or negative correlation between students' completion of a series of related CTE courses and earned industry-recognized credentials and students' sense of self-efficacy.

H_1: There is a positive correlation between students' completion of a series of related CTE courses and earned industry-recognized credentials and students' sense of self-efficacy.

In this research, Social Cognitive Career Theory (SCCT) was used to explore how high school students' CTE experiences, which included completing a sequence of courses within a career pathway, participating in authentic work-based experiences (e.g. clinical experiences, work-based learning, simulations, etc..), and attaining an industry-recognized credential(s) affected self-efficacy in pursuing plans to directly enter the workforce or complete post-secondary training in the pathway after graduation. SCCT, developed by Robert W. Lent, Steven D. Brown, and Gail Hackett in 1994 is based on Albert Bandura's general social cognitive theory, of which self-efficacy is the foundation (Bandura, 1997; Betz & Hackett, 2006). According to Bandura (1977, 1982, 1993, 1997) persons' pursuit of an activity is based on the level of belief they have in their capability to achieve a desired level of performance on

that activity. SCCT is grounded in the assumption that a strong self-efficacy is the basis for persons' interest in, pursuit of, and performance in activities in which they feel they have attained the necessary skills and environmental supports in which to successfully pursue (Lent et al., 2002). Bandura (1977, 1997) has shown that the most influential source of information on self-efficacy is attained through enactive mastery experiences. As students repeatedly, successfully perform a task, self-efficacy is strengthened, and these successful experiences contribute authentic evidence as to future success in related areas (Usher & Pajares, 2008).

Review Of Literature

School Environment and Self-Efficacy

A situational setting in a CTE environment can provide opportunities for practice that can be cross-curricular and transferrable into actual on-the-job success such as an automotive shop or hospital setting. Based on the literature, school environments can have an influence on students' sense of self-efficacy. Research on self-efficacy in isolated school settings has revealed that self-efficacy beliefs in core topics may be affected for students who attend high school in a vocational setting versus a regular, academic high school setting.

Taşdemir (2016) examined mathematics self-efficacy of 178 students (61 females and 117 males) in seven post-secondary vocational programs from the Tatvan Vocational School of Bitlis Eren University during the 2014-2015 school year. One hundred (100) of the 178 students studied graduated from a vocational high school. The researchers found a significant difference in math-efficacy based on the type of high school the students attended with those attending a vocational high school reporting significantly lower than those attending the Anatolian and general high schools. Taşdemir (2016) recommended including more activities in instructional methods to develop stronger self-efficacy in students.

Similar findings on self-efficacy of high school students in a vocational school setting were found in research that studied writing self-efficacy perceptions. Demirel and Aydin (2019) studied a total of 585 students (270 female and 315 male) in ninth and tenth grade classes from high schools of different types from the Buca District of Izmir Province in Turkey. As noted in the math studies, self-efficacy perceptions of writing were more positive from those who attended the Anatolian science high school than those who attended the vocational high school.

The results of this body of research indicates that instruction, given in isolation, may affect students' sense of self-efficacy toward a specific core body of knowledge. However,

through an integrative means that provide opportunities for application in a mastery learning format, self-efficacy in core topics may be altered. This change in learning format can be found through contextual learning experiences. Contextual Teaching and Learning (CTL) provides students with the opportunity to draw upon their existing knowledge and learn subjects through an integrated, multidisciplinary approach that allows for identification and solving of problems, wise decision making, and creative thinking (Berns & Erickson, 2001).

Contextual Learning Experiences in Support of Self-Efficacy

Self-efficacy beliefs are developed over time through certain conditions that ensure the learning environment provides opportunities for interaction, observation, experiential learning, and feedback (Bandura, 1982; Hodges & Harris, 2017). Preparation for the workplace involves having confidence in one's ability to accomplish specific performance tasks successfully, and students are placed in a better position to put what they have learned into practice when they have self-belief (Manz & Manz, 1991). A contextualized teaching approach that utilizes effective teaching strategies can provide students with a rich learning experience that can emphasize the importance of merging academics with technical experiences (Doolittle & Camp, 1999). CTE courses are opportunities for teachers to employ contextual learning strategies to provide students opportunities to practice skills in a real-world context. These contextual learning style strategies are designed to increase mastery experiences through a real-world perspective connected to occupational interests and include strategies such as problem-based and community-based learning practices.

Brown (1999) explained that problem-based learning (PBL) is a strategy used to connect learning to the workplace. Through this contextual learning strategy, a source of self-efficacy, mastery learning experience, is a focus as students investigate a problem and use their skills to work out a solution.

Research on the effect of PBL on the self-efficacy beliefs of software engineering students was conducted by Dunlap (2005) utilizing a capstone project designed to determine if students could demonstrate the ability to use the culminating experiences and skills learned throughout the program to meet the professional needs of employers upon entry into the workforce. Thirty-one (31) students participated in the 16-week undergraduate course which utilized a nonexperimental, single-group research design to describe students' experiences. Findings coded throughout the reflective journaling process revealed that at the beginning of the

course, all students were concerned about their abilities and need to learn more before entering the real world. However, over the course of the project, students' self-efficacy beliefs in their abilities to apply knowledge to complete software development projects and meet employer needs increased. Dunlap (2005) noted that by the end of the study, a significant, positive change was reported in students' perceptions of their abilities and readiness to enter the workforce in the software engineering profession. Dunlap (2005) explained that sources of self-efficacy are supported in the PBL project through collaboration efforts of problem-solving, which allows for peer assessment and feedback (vicarious learning), and through the actual performance of applying skills to work through an authentic, work-based problem (mastery experience).

Other forms of contextual learning include project-based learning (PBL) and school-to-work opportunities (Berns & Erickson, 2001; Brown, 1999). Through these experiences, students work in an environment that is supported by parents, teachers, and community partners who provide support, examples, and coaching within the learning process. Students work on real-world scenarios which require effort and persistence over time that develops their work-place skills, such as problem-solving, and increases their career awareness (Brown, 1999).

Chen et al. (2015) studied Collaborative Project-Based Learning (CPBL) to determine if this strategy would affect the development of self-efficacy in urban minority students enrolled in a computer networking course at a state university in Los Angeles. Twenty-eight (28) students, comprised mainly of Hispanic (53%) and Asian-American (22%) descent, participated in the exploratory case study research. Students were given a total of five projects throughout the ten-week course that progressed in difficulty to allow students to use their design knowledge and skills in a team setting to simulate an authentic work environment. Results of a pre-survey to determine self-efficacy in general and domain specific computer engineering were in contradiction to the research by Dunlap (2005) as the students reported an overall high level of general and engineering self-efficacy toward the beginning of the course. Overall, the pre-test did reveal that Hispanic students reported lower levels of self-efficacy than their peers. However, based on post-test results, the researchers found that students' self-efficacy beliefs in their skills to identify user needs and design specifications on a network system had, in some cases, increased to a higher level than their peers. As in the previous research noted, the qualitative and quantitative results supported the findings of an increase in self-efficacy in subject matter skills as well as the development of self-efficacy in people skills which is needed for employment in

this field. Chen et al. (2015) contributed the outcomes to the opportunity students had to participate in an authentic work project experience that gave students an opportunity to apply previous knowledge and develop new skills in a situated, open-ended project that provided intrinsic motivation.

Another contextual learning strategy that can affect a student's self-efficacy is the participation in authentic, work experience opportunities. Cunnien et al. (2009) stated that as students successfully complete specific on-the-job tasks, confidence in the ability to perform tasks in future employment may increase, and students who participate in work experiences during high school exhibit more self-efficacy in making future plans. Using data gathered from a population of 1,010 students over a four-year longitudinal study of the Youth Development Study (YDS) from students in Minnesota, Cunnien et al. (2009) studied the influence that work investment and the quality of the work experience had on high school students' sense of self-efficacy. At the end of the four years, nearly 93% of the students completed the study. Findings noted that students who held steadier employment reported higher levels of self-efficacy development than those who only worked occasionally, and these results coincide with students' self-efficacy about their future in adult roles. Cunnien et al. (2009) stated that findings revealed the importance of student participation in work experience while in high school due to psychological affects that early entry into the labor force may have on self-efficacy beliefs of high school students.

In contrast, Haddad and Marx's (2018) research on the use of a Supervised Agriculture Experience (SAE) work-based learning experience to analyze if participation had an effect on students' career decision self-efficacy and soft-skill attainment did not find a significant effect. Data were collected on 108 eleventh and twelfth grade students from eight high schools in Minnesota who participated in the SAE with fifty-seven (57) of the students reported being enrolled in the work-based learning option. The researchers found moderately high confidence in career decision self-efficacy with self-appraisal (the ability to make career decisions) ranking the highest and problem-solving ability the lowest. However, no significance was found on the effect of participating in an SAE program and career-decision self-efficacy. Hadad and Marx (2018) noted that these results may be due to students' development of CDSE through integration (across disciplines) such as participation through other agriculture programs or elsewhere in their lives.

Reddan (2016) used a case study design to determine the effects that work-based learning activities embedded in the final year of a Bachelor of Exercise Science program at Griffith University in Australia had on the self-efficacy of sixteen students. At the conclusion of the course, students were asked to complete a questionnaire that required ranking of the various course components (work experience placement, career development workshop, and presentations) to determine the effect on their work self-efficacy development. Results indicated a significant improvement in work self-efficacy due to participation in the course learning experience. The researchers also found that students ranked the work experience placement as most significant in increasing their work self-efficacy. Student responses on the questionnaire provided insight as to how the work experience increased self-efficacy in matriculating into an actual work setting as students reported the experience provided opportunities to practice skills learned through the exercise science program, and this practice resulted in improved communication skills, multitasking abilities, and the ability to think on their feet.

Individuals' sense of self-efficacy must be strengthened before they are able to pursue new opportunities and the belief in their abilities to perform will decrease their vulnerability to conditions that may not be supportive and help them persevere when facing setbacks (Mager, 1992). Separation of schools by academic core skills and vocational skills can reduce students' sense of self-efficacy in academic subjects of math and writing (Demirel & Aydin, 2019; Taşdemir, 2016). However, environments that support CTL experiences such as problem-based learning, project-based learning and authentic work experiences which provide opportunities for interaction, observation, experiential learning, and feedback can have a significant positive impact on student self-efficacy (Chen et al., 2015; Cunnien, et al., 2009; Dunlap, 2005; Reddan, 2016).

Methods

The New General Self-Efficacy (NGSE) Survey was used in this research to determine students' sense of self-efficacy in relation to CTE course taking and earning IRCs. The NGSE consists of 8-items and uses a 5- point rating scale to measure persons' belief in their ability to overcome difficulties to achieve. Responses ranged from 1 = strongly disagree to 5 = strongly agree on the self-efficacy variables of: (a) achieve goals; (b) certainty in accomplishing goals; (c) obtaining outcomes of importance; (e) success in most endeavors; (f) perseverance in overcoming challenges; (g) performance on various tasks; (h) confidence in performance as

compared to others; and (i) adversity when situations are difficult. Scoring of the scale consisted of calculating the total score for a participant and averaging by dividing this total by the number of questions (8). This research also utilized a survey to gather general data about the students and allowed students to self-report the work-based learning activities in which they participated related to their coursework, and IRCs earned while in high school. Students were also asked to describe career plans after high school and to note if their coursework and credentials influenced or supported their decision to pursue their choice of career.

Context of Study

Students who attended a technical high school in a southern state were chosen to participate in the study as this is a technical school that serves six high schools and one alternative school. The school system in which this study is situated has an enrollment of 22,750 students and is comprised of twenty elementary schools, 7 middle schools, 6 high schools, 1 alternative school and 1 technical high school. Fifteen of the schools are low socio-economic Title I schools (11 elementary, 2 middle schools, and 2 high schools). The school district continuously exceeds the state average in assessment scores and graduation rate and is considered one of the fastest growing districts in the state.

The high schools are on a 4 x 4 block schedule. Students attend the regular high schools for core courses and attend the technical school during either the morning (blocks 1 and 2) or afternoon (blocks 3 and 4) for specific career-related courses. The technical high school serves approximately 1000 students each year. Students attend the fall and/or spring semester, often in their junior or senior year. Students choose to take courses at the technical school based on their interests (exploration) or to begin training for future career choices. The curriculum is grounded in Contextual Teaching and Learning (CTL) strategies that involve problem and project-based learning opportunities, as well as authentic work experiences (Appendix A). Most of the courses offer an IRC that may be a requirement for graduation or an entry-level proof of skills attainment for employment, as well as an authentic work experience (Appendix B).

Sample

All students who completed a CTE course and earned an IRC in the state comprised the research population. The target sample was twelfth grade students, who had completed one or more series of CTE courses while attending the technical school during the spring semester of their senior year in high school (Table 1) in the following courses: (a) Automotive Technology;

(b) Carpentry; (c) Certified Medical Assistant (CMA); (d) Collision Repair; (e) Culinary Arts; (f) Emergency Medical Technical-Basic (EMT); (g) Graphic Arts; (h) Outdoor Power Equipment; and (i) Welding. This specific population was chosen due to their availability and senior status which afforded them increased opportunities to obtain CTE credits and IRCs. The senior status and spring semester also conveniently corresponded with the timing of graduation which often includes making career decisions (Tang et al., 2008).

Table 1

Target Population by Course and Gender

Course	Number of Students	Male	Female
Automotive Technology	17	17	0
Carpentry	13	12	1
Certified Nursing Assistant	26	5	21
Certified Medical Assistant	14	2	12
Collision Repair	16	16	0
Culinary Arts	23	12	11
Emergency Medical Technician-EMT Basic	11	8	3
Graphic Arts	19	9	10
Outdoor Power Equipment	19	19	0
Welding	30	26	4
Population Total	188	126	62

Study Sample and Frequency Distribution

The sample size was 93 student completed survey respondents (51 male, 42 female) out of a target population of 188 students meeting the study criteria. The selected independent variable data for "CTE Series Taken," "Number of Courses Taken," "Work-based Experience," and "Job Influence" are shown in Table 2 and 3, respectively.

Table 2

Study Sample and CTE Series and the Number of Courses Taken Variable Data

Variable	Frequency	Percentage	Valid Percentage	Cumulative Percentage
"CTE Series Taken"				
ABR/Automotive	1	1.1	1.1	
Auto Body Repair (ABR)	5	5.3	5.3	
Automotive	4	4.3	4.3	
Auto/Electrical	1	1.1	1.1	
Auto/Welding	1	1.1	1.1	
Carpentry	4	4.3	4.3	
Carpentry/Welding	3	3.2	3.2	
Certified Nursing Assistant (CNA)	16	17.2	17.2	
Culinary Arts	7	7.5	7.5	
Early Childhood Education*	1	1.1	1.1	
EMT	10	10.8	10.8	
Graphic Arts	13	14.0	14.0	
Medical Assistant	11	11.8	11.8	
Outdoor Power Equipment (OPE)	3	3.2	3.2	
OPE/Automotive	1	1.1	1.1	
OPE/Welding	1	1.1	1.1	
Welding	11	11.8	11.8	
Total	93			100

"Number of Courses Taken"				
1 Course	13	14.0	14.0	
2 Courses	22	23.7	23.7	
3 Courses	19	20.4	20.4	
4 Courses	12	12.9	12.9	
5 Courses	14	15.1	15.1	
6 Courses	7	7.5	7.5	
7 Courses	4	4.3	4.3	
8 Courses	2	2.2	2.2	
Total	93			100

*Originally counted in Graphic Arts, removed due to coursework and IRC related to ECE pathway.

Table 3

Work-Based Experience and Job Influence Variable Data

Variable	Frequency	Percentage	Valid Percentage	Cumulative Percentage
"Work-based Experience"				
No	48	51.6	51.6	
Yes	45	48.4	48.4	
Total	93			100.0
"Job Influence"				
No	26	28.0	28.0	
Yes	67	72.0	72.0	
Total	93			100.0

Descriptive Statistics

Descriptive statistical analyses were conducted on all study variables. Analyses included variable distribution normality. The study focused on the relationship between the student respondents' sense of self-efficacy (SE) and their completion of a CTE Series *and* the earning of IRCs.

Table 4

SE Conditional Variable Normal Distribution Analysis

Variable	Approximately Normally Distributed
SE Achievement	No
SE Certainty	Yes
SE Importance	No
SE Success	No
SE Perseverance	Yes
SE Performance	Yes
SE Confidence	Yes
SE Adversity	No

The results of the normality analyses, reported in Table 4, revealed fifty percent (50%) of the SE conditional variables were approximately normally distributed, fifty percent (50%) were not normally distributed.

Data Analysis

A Pearson Product Moment Correlation (Pearson's r) test was used to examine the data gathered from the surveys to answer the research questions and address the hypotheses. The study used the SE conditional variables determined to be approximately normally distributed (SE Certainty, SE Perseverance, SE Performance, and SE Confidence) to answer the study questions

and hypotheses. The researchers examined the relationship between students' self-efficacy and students' culmination of mastery experience through coursework, activities, and IRCs. The statistical software SPSS was used to conduct the analysis. Significance was reported as perfect negative correlation (-1), no correlation (0), or perfect positive correlation (+1).

Correlation Findings

The Pearson's *r* correlation analyses confirmed that completion of a series of CTE courses was weakly and positively correlated with students' sense of self-efficacy for the SE Certainty (.05) and SE Perseverance (.01) variable respectfully. Earning industry-recognized credentials (IRCs) was weakly and positively correlated with SE Performance variable at the .05 significance level. Additionally, the calculated variable, SUM CTE/IRC, demonstrating the summative strength of the completion of a series of CTE courses *and* earning IRCs, was weakly and positively correlated with SE Perseverance and Performance at the .05 significance level (Table 5).

Table 5

Pearson's r Correlation Coefficients and Significance

Question 1	Completion of Series (CTE)	Completion of IRCs	SUM CTE/IRC	Significance (CTE, IRC, SUM)
SE Certainty	**.208**	.034	.200	**.046**/.510/.055
SE Perseverance	**.202**	.143	**.221**	**.010**/.171/**.033**
SE Performance	.183	**.215**	**.232**	.079/**.038/.025**
SE Confidence	.171	.028	.154	.101/.791/.140

Bold values = weak, positive significant correlations at the .01 and .05 levels.

Given the Pearson's *r* correlation coefficients for the research question, the researchers determined mixed correlation results existed between the completion of a series of CTE courses *and* earning industry-recognized credentials. No correlation or negative correlation resulted between: (a) students earning industry-recognized credentials and students' sense of self-efficacy (SE Certainty, SE Perseverance, and SE Confidence) and (b) the calculated variable, SUM

CTE/IRC, and students' sense of self-efficacy (SE Certainty and SE Confidence). There is a weak positive correlation between (a) students' completion of a series of related CTE courses and students' sense of self-efficacy (SE Certainty and SE Perseverance): (b) students earning industry-recognized credentials and students' sense of self-efficacy (SE Performance); and (c) the calculated variable, SUM CTE/IRC, and students' sense of self-efficacy (SE Perseverance and SE Performance).

Summary of Quantitative Findings

In summary, correlation analyses revealed that completion of a series of CTE courses and earning industry-recognized credentials was weakly correlated with students' sense of self-efficacy in Perseverance and Performance. The researchers found that completion of a series of CTE courses and earning an IRC revealed mixed results. Therefore, the researchers rejected the null hypothesis for SE Certainty and SE confidence and accepted the alternative hypothesis for SE Perseverance and SE Performance. In other words, there is a positive correlation between students' completion of a series of related CTE courses and earned industry-recognized credentials and students' sense of self-efficacy in Perseverance and Performance.

Discussion

Research reveals that self-efficacy beliefs are developed over time through certain conditions that ensure the learning environment provides opportunities for interaction, observation, experiential learning, and feedback (Bandura, 1982; Hodges & Harris, 2017). The technical school environment in which this study was situated provides students with such opportunities designed to enrich mastery experiences of students. These experiences include lab, shop, and work-based learning (WBL) experiences and curriculum designed to prepare students to take industry-recognized credentials (IRCs) in preparation for entry-level employment within fields of study. Based on the literature, school environments can have an influence on students' sense of self-efficacy. Separation of schools by academic core skills and vocational skills can reduce students' sense of self-efficacy in academic subjects of math and writing (Demirel & Aydin, 2019; Taşdemir, 2016). However, environments that support CTL experiences such as problem-based learning, project-based learning, and authentic work experiences which provide opportunities for interaction, observation, experiential learning, and feedback can have a significant positive impact on student self-efficacy (Chen et al., 2015; Cunnien, et al., 2009; Dunlap, 2005; Reddan, 2016). Though the research discussed in the review of literature reflected

the results of this study, the researchers anticipated that the technical school environment that employed these CTL strategies would reveal a more significant impact on students' sense of self-efficacy in the four (4) normally distributed SE variables analyzed: (a) SE Certainty; (b) SE Perseverance; (c) SE Performance; and (d) SE Confidence. However, the researchers found that completion of a series of CTE courses and earning IRCs was weakly correlated with the conditional variables of SE Perseverance and SE Performance. These results partially align with Haddad and Marx's (2018) research which did not result in a significant effect on self-efficacy through participation in a supervised, authentic work experience.

Unexpected Results

An unanticipated finding when analyzing the SE conditional variable data question-by-question was the exceptionally high mean averages, above 4.0 (equivalent to an "Agree" response) for all students regardless of program in which enrolled (Table 6). Three SE variables reported the highest means: (a) achievement (4.52)—students believe they will achieve most goals they set; (b) importance (4.49)—students believe they will attain outcomes that are important to them; and (c) success—students believe they can succeed in most any endeavor in which they set their mind. According to Bandura (1977, 1997), enactive mastery experiences provide the most influence on self-efficacy. Cunnien et al. (2009) emphasized that successful completion of specific on-the-job tasks results in an increase in confidence in one's ability to perform tasks in future employment, and through participation in work experiences in high school, students exhibit more self-efficacy in making future plans.

Through the analysis of the work-related experience response on the survey, forty-two percent (42%) of the students self-reported that they had participated in a WBL experience (Table 6). This high response may include the consideration of lab and shop activities which simulate real-world, work environments as a WBL experience. Therefore, these experiences may be a contributor to the overall high mean scores on the survey as supported by Cunnien et al. (2009).

Table 6

SE Conditional Variable Response Averages for all CTE Series—Highest to Lowest Values (Effects of courses taken, Certifications Achieved, Work-Related Experience and Career Decision Influences)

CTE Series	Student Average Response	Average Courses Completed	Average Certification Achieved	Work-Related Experience	Career Decision Influence
ABR/Auto	4.48	2.75	2.67	5-Yes; 7-No	9-Yes; 3-No
Carpentry	4.65	3.20	2.00	3-Yes; 2-No	3-Yes; 2-No
CNA	4.39	3.25	2.00	2-Yes; 14-No	12-Yes; 4-No
Culinary	4.13	4.43	0.43	2-Yes; 5-No	1-Yes; 6-No
Early Child	3.38	1.00	1.00	0-Yes; 1-No	0-Yes; 1-No
EMT	4.33	2.50	3.10	3-Yes; 7-No	8-Yes; 2-No
Graphic Arts	3.83	1.69	1.15	6-Yes; 7-No	7-Yes; 6-No
Medical Asst	4.18	5.55	3.00	6-Yes; 5-No	11-Yes; 0-No
OPE	4.68	3.60	2.80	3-Yes; 2-No	4-Yes; 1-No
Welding	4.45	5.01	2.38	9-Yes; 4-No	12-Yes; 1-No
Averages	4.30	3.30	2.05	42%	72%

Student respondents in all series n = 93

The number of IRCs completed by students can also contribute to a higher sense of self-efficacy (Randall et al., 2013). Students averaged two (2) IRCs across the programs of study, and those participating in the Medical Assistant program averaged three (3). This average also corresponded with the higher level of courses completed (5.55) which means students were afforded many opportunities for mastery experiences within this program (Table 6).

It is also noted that seventy-two percent (72%) of the students reported that the courses they were taking had a direct influence on the fields in which they planned to seek future

employment. Research indicates that self-efficacy plays a key role in persons' choice and persistence in academic and career pursuits (Betz & Hackett, 1981, 1983; Brown et al., 1989; Lent & Hackett, 1987; Lent et al., 1987). This indicates students are committed to a career within the pathway they chose to study (as revealed through the number of CTE courses and IRCs completed) and believe they will be successful in attainment of a career within the pathway as revealed. These findings support the three areas identified as the highest mean scores (achievement, importance, and success) which suggest students believe they will achieve and be successful at goals they find important. Limitations include the sample size (n = 93) of the district's high school students as only seniors enrolled in specific courses were included and the possibility of subjectivity of instructors' means of interpreting and implementing PBL. This study also took place during the Covid-19 pandemic, and the students' final semester was impacted by the instructional changes that resulted from this.

Conclusion

The purpose of this quantitative study was to investigate students' sense of self-efficacy toward post-secondary employment after completing a series of CTE courses which provide various mastery experiences and culminate in an IRC. The findings of this study, though not resulting in strong, significant correlational results, reveal that all students participating in this study have an unusually high, overall sense of self-efficacy. As the review of literature indicates, school environment that immerses students in mastery experiences through CTL strategies can build student self-efficacy. Based on the CTE school environment in which this study was situated, these students were provided mastery experiences as accumulated through a series of CTE courses and authentic work-based experiences designed around CTL strategies (Appendix A). This CTE environment, and its results, support the literature findings. An educational environment that is segregated in its approach to academic and vocational subjects hinders students' sense of self-efficacy (Demirel & Aydin, 2019; Lent & Hackett 1987; Multon et al., 1991; Pajares, 1996; Taşdemir, 2016). Instructional approaches that infuse CTL strategies such as problem and project-based learning and authentic work experiences can increase students' sense of self-efficacy in the transference of skills across disciplines (Chen et al., 2015; Cunnien et al., 2009; Doolittle & Camp, 1990; Dunlap, 2005;), thus bolstering student confidence in performing tasks in future employment (Cunnien et al., 2009).

Based on the findings and limitations of this study, the researchers have some recommendations for further study. Future researchers may choose to track students beyond high school graduation to compare self-efficacy beliefs once students' have transitioned out of the secondary setting. Another recommendation is to utilize a mixed method study for further insight into self-efficacy beliefs through focus groups and interviews which would allow for triangulation. These recommendations and further research have the potential to contribute further to an understanding students' confidence in seeking post-secondary employment.

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Appendix A

CTL Strategies Supportive of Mastery Experiences Within the Technical School Environment

	CTL Strategies Providing Mastery Experiences	
Program of Study	**Problem/Project-Based Learning Integrating Core Academics**	**Authentic Work Experience**
Automotive	Math Environmental Science	Automotive Shop WBL-Internships
Carpentry	Math Environmental Science	Carpentry Shop WBL-Internships
Certified Nursing Assistant	Math Biology/Human Anatomy	Nursing Lab Clinical Experience
Medical Assistant	Math Biology/Human Anatomy	Nursing Lab Clinical Experience
Collision Repair	Math Environmental Science	Collision/Paint Shop WBL-Internships
Culinary Arts	Math Science	Restaurant Kitchen WBL-Internships
EMT-Basic	Math Biology/Human Anatomy	Lab Ambulance Simulator Ambulance Ride Outs
Graphic Arts	Math English	Computer Lab Print Shop WBL-Internships

Outdoor Power Equipment	Math Environmental Science	Small Engine Shop WBL-Internships
Welding	Math Environmental Science	Welding Shop WBL-Internships

Appendix B

Technical School Course Offerings, IRCs, and Work Experiences

Courses	Industry-Recognized Credential	Work-Based Learning
Accounting	None	None
Automotive Technology I, II, III, IV	Automotive Service Excellence-Entry-Level S/P2 OSHA 10	Advanced students may participate in a paid or unpaid internship opportunity.
Barbering I, II, III, IV	Students earn hours toward 1500 required for Barbering license.	Students participate in shop experiences that count toward barber licensing hours.
Career & Technical Education Internship I, II	Customer Service	Students are required to earn a minimum of 180 paid work hours for course credit.
Carpentry I, II, III, IV	NCCER Carpentry Core, Level 1 and/or Level 2 OSHA 10	Advanced students may participate in a paid or unpaid internship opportunity.
Certified Medical Assistant	Certified Clinical Medical Assistant	Students may participate in a clinical experience in doctor's offices or hospitals.
Certified Nursing Aide	Certified Nursing Aide	Students participate in a clinical experience in the nursing home and hospital. (minimum of 45 hours required)
Collision Repair I, II, III, IV	Collision Repair & Refinish Pro Level I (I-CAR) S/P2	Advanced students may participate in a paid or unpaid internship opportunity.
Computer Programming	Students complete coursework toward earning the SWIFT App Development certification.	None
Cooperative Marketing Education I & II	Customer Service	Students are required to earn a minimum of 540 hours in a paid work experience.
Criminal Justice I & II	None	None
Culinary Arts I, II, III, IV	ServSafe Food Handler ServSafe Protection Manager	Advanced students may participate in a paid or unpaid internship opportunity.
Early Childhood Education	Students complete coursework toward earning the Child Development Association (CDA) certification. First Aid/CPR	Students participate in unpaid internships at pre-school facilities.
Electrical/Instrumentation	NCCER Electrical Helper	None
Emergency Medical Technician-Basic	First Responder Emergency Medical Technician-Basic CPR	Students participate in ride-out experiences with ambulance service. Minimum of 10 patient contacts required.
Graphic Arts I, II, III, IV	Adobe Certified Associate (Illustrator, InDesign, and/or Photoshop	Advanced students may participate in a paid or unpaid internship opportunity.
Hospitality & Tourism I & II	Customer Service Certified Guest Services Professional	Students participate in unpaid internship with Hilton.
Introduction to Health Occupations	First Aid/CPR	None—This course serves as a pre-requisite to the CNA course.
Maintenance Assistant	NCCER Core OSHA 10 First Aid/CPR	None
Outdoor Power Equipment I, II, III, IV	Four Stroke Engine Technician	Advanced students may participate in a paid or unpaid internship opportunity.
Project-Lead-the-Way (Pre-Engineering)	None	None
Sports Medicine	First Aid/CPR	None—This course serves as a pre-requisite to the CNA course.
TV Production I & II	Adobe Certified Associate (Premiere Pro)	Advanced students may participate in a paid or unpaid internship opportunity.
Welding I, II, III, IV	NCCER Welding Core, Level 1 and/or Level 2 OSHA 10	Advanced students may participate in a paid or unpaid internship opportunity.