

The Effects of Scheduling Options on CTE Courses in South Texas

Heriberto Hernandez, EdD

**Associate Provost
Strategic & Collaborative Partnerships
Laredo College, Laredo, TX**

Jeffery Chernosky, EdD

**Assistant Professor of Educational Leadership
Co-Coordinator of the Educational Administration
and Instructional Technology Graduate Programs
Department of Educational Leadership and Counseling
College of Education and Human Performance
Texas A&M University-Kingsville**

Linda Challoo, EdD

**Professor of Educational Leadership
Co-Coordinator of the Instructional Technology Graduate Program
Coordinator for the STEM Certificate Doctoral Program
Department of Educational Leadership and Counseling
College of Education and Human Performance
Texas A&M University-Kingsville**

Daniella G. Varela, EdD

**Assistant Professor of Educational Leadership
Coordinator of the Educational Leadership Doctoral Program
Department of Educational Leadership and Counseling
College of Education and Human Performance
Texas A&M University-Kingsville**

Abstract

The efficacy of the CTE curriculum and program delivery can be affected by both internal and external factors. The purpose of this causal-comparative quantitative study was to investigate the effects of course scheduling on CTE programs in six South Texas community colleges during the 2020-2022 academic years. This study utilized the Kruskal-Wallis test to analyze statistical significance between CTE course performance and CTE course scheduling options of 4-week, 8-week and 16-week.

Keywords: skills gap, career technical education, time-compressed course, persistence

Occupations and industries requiring specialized training and skills are experiencing severe labor shortages across the United States (Ferguson & Lucy, 2022). The state of Texas has the 2nd largest economy in the United States (Federal Reserve Bank of Dallas, n.d.). The Texas Workforce Commission [TWC] projects an increase of 14.7% in employment by 2030 (n.d.a, p. 4). In South Texas, the region's labor force is expected to grow by 17% (TWC, n.d.b, p. 29). There is a growing concern that without action, there will be a failure to provide Texas employers with a skilled workforce, endangering the prosperity of an entire generation (Texas Commission on Community College Finance, n.d.). Community colleges, particularly Career Technical Education (CTE) programs, play an essential role not only in training a community's workforce but in economic development and social mobility (Williams & Nourie-Manuele, 2018). CTE programs are driven by the needs of their respective regional occupational demand, these programs offer short-term one-semester to two-year credentials.

Completion of the highest credential available in a CTE program may benefit the attainment of advanced technical skills, potentially affecting students' gainful employment and the labor force in the region. For this reason, institutions continuously explore program efficacy and retention strategies. Essential to retention goals are program delivery strategies, particularly in CTE programs (Jacobs & Worth, 2019). As the higher education landscape continues to evolve institutions are adapting to generational shifts (Holston, 2020). Based on generational theory, Generation Z values higher education and its role in gainful employment, but the Generation Z student population wants to achieve their goal in the most efficient manner (Holston, 2020).

Community colleges rely on alternative scheduling, such as compressed scheduling to increase enrollment and retention (Holston, 2020). Compressed scheduled courses are commonly offered in eight-week and four-week formats; traditional college semesters are typically sixteen weeks. Historically, research in compressed scheduling has been conducted on general education courses in four-year institutions (Holston, 2020). Research on the effects of compressed scheduling on student grades and retention in CTE programs may be beneficial to a student's high skill level attainment. This research can assist the six community colleges in the South Texas region to better address the growing workforce demand of the region.

Literature Review

Community colleges have historically played a major role in supplying the United States with a trained workforce (Atwell et al., 2022). Recently many states are experiencing a middle skills gap in their respective industries (Edgerton, 2022). Higher education institution leaders are tasked with meeting the demand with the needs of the workforce in an efficient and effective manner.

Community Colleges

Two of the central roles of community colleges are to provide introductory college-level courses to students who intend to transfer to a four-year institution and to supply a trained workforce to the respective regional labor market (Jabbar & Edwards, 2019; Jacobs & Worth, 2019; Lazarowicz & McGill, 2020; Schudde & Jabbar, 2021). Colleges serve as an equitable force in higher education; students are equally able to apply, register and attend a community college regardless of socioeconomic status and demographics (Ali-Coleman, 2020). The dynamics of the

workforce and diverse needs of today's students require flexibility, equality and access. Community colleges provide several pathways for students who are seeking gainful employment or upward mobility in their current occupational field. These range from entering the job market, upskilling, or transferring to a four-year institution (Haviland & Robbins, 2021; Stevens et al., 2019).

Career Technical Education

Community colleges have traditionally worked with industry to provide workforce training aligned to the needs of the respective geographic industries. Career Technical Education (CTE) programs remain essential in supplying a trained workforce through various education levels. CTE program credentials range from short-term certificates to associate degrees; more institutions are adding baccalaureate technical degrees (Grosz et al., 2022; Haviland & Robbins, 2021; Atwell et al., 2022). The literature on CTE programs suggests that CTE academic options provide a flexible vehicle for attaining academic skills, technical skills, and customized industry training to prepare students for the workplace (Ashwin, 2022; Cuellar et al., 2022; Edgerton, 2022; Northern & Petrilli, 2019; O'Banion, 2019).

Compressed Scheduling

Compressed course length refers to a course that meets for fewer than the traditional number of weeks while still delivering the same number, of course, contact hours and awarding the same number of credits (Holston, 2020; Mokher et al., 2021). Course length is often modeled from preexisting academic structures or programs. Courses that are one to three weeks in length are typically used during summer sessions or interim terms (Walsh et al., 2019; Williamson, 2017). According to Mokher et al. (2021), compressed courses may provide more significant opportunities for pedagogical diversity due to more extended classroom session periods. Current literature suggests compressed courses have achieved better results than traditional development courses in completing gateway courses (Conley, 2020; Mokher et al., 2021).

Theoretical Frameworks

Experiential learning theory literature reveals that experiential learning provides the vital link between formal education and adult life, serving as the mechanism that integrates education and work (Kolb, 2014, as cited in Alfaro, 2022). During active experimentation, an emphasis is placed on practical application that aims at a deeper understanding of the topic. Cognitive load theory is an instructional design theory based on human cognitive architecture (Sweller et al., 2019; Taylor et al., 2022). The main objective of cognitive load theory is to clarify how the information processing load prompted by learning tasks can affect the ability to process new information (Sweller et al., 2019). These cognitive loads directly impact learning, with all having the potential to promote or hinder learning (Sweller, 1988, as cited in Taylor et al., 2022).

Purpose of the Study

This causal-comparative quantitative study investigated the effects of scheduling options in CTE programs at six South Texas community colleges during the 2020-2022 academic years. The correlation between student performance, course completion and scheduling options was measured in this study. The population of interest were students in Career Technical Education programs between the ages of 18-65 in six community colleges in the South Texas region. The results of this study may be used as a guide for community colleges and their CTE programs in addressing the growing needs of a trained workforce for the South Texas region.

Method

Research Questions

This study addressed two research questions that are aligned with the purpose of this study. The research questions were the following:

RQ1: Is there a statistically significant effect on student performance (grades) based on CTE course scheduling options in six community colleges in the South Texas region?

RQ1a: Is there a statistically significant effect on student performance (grades) based on a 4-week CTE course schedule compared to traditional 16-week CTE course schedule in six community colleges in the South Texas region?

RQ1b: Is there a statistically significant effect on student performance (grades) based on an 8-week CTE course schedule compared to a traditional 16-week CTE course schedule in six community colleges in the South Texas region?

RQ1c: Is there a statistically significant effect on student performance (grades) based on a 4-week CTE course schedule compared to an 8-week CTE course schedule in six community colleges in the South Texas region?

RQ2: Is there a statistically significant effect in CTE course completion rates based on CTE course scheduling options in six community colleges in the South Texas region?

RQ2a: Is there a statistically significant effect in CTE course completion rates based on a 4-week CTE course schedule compared to traditional 16-week CTE course schedule in six community colleges in the South Texas region?

RQ2b: Is there a statistically significant effect in CTE course completion rates based on an 8-week CTE course schedule compared to a traditional 16-week CTE course schedule in six community colleges in the South Texas region?

Research Design

A causal-comparative quantitative study was utilized to investigate the effects of course scheduling in CTE programs in six South Texas community colleges during the 2020-2022 academic years. This study examined if a statistically significant difference existed in student performance (grades) and CTE course completion rates based on three CTE course scheduling options. Specifically, the study utilized 16-week, 8-week and 4-week schedule options to compare student performance and course completion rates in CTE courses. A non-experimental design was

applied; the data collected was archival from six two-year institutions in South Texas. The correlation between student grades, retention, and scheduling options was measured. The Kruskal-Wallis Test, a nonparametric statistic, was appropriate based on the data for the dependent variable being ordinal (McMillian & Schumacher, 2010). Frequency distribution was utilized for both dependent and independent variables.

Data Collection, Population, and Analysis

The archival data gathered for this study was in the form of student grades for CTE courses that were offered in 4-week, 8-week, and 16-week schedule options. The categories of A, B, C, D, and F were used to indicate grades earned. The dependent variable (RQ2) of completion percentage rates was used to measure course completion on a nominal scale. One nominal independent variable (IV) with three levels: 4, 8, and 16-week course duration was presented. One dependent variable (DV), grades at an ordinal level, was also presented. Only CTE credit bearing courses were included in the study. For this study, the target population were students between the ages of 18-65 who had completed CTE courses at one of the six subject institutions ($N=29,835$). The target population were students who completed CTE courses in one of the six community colleges in the South Texas region. A total of 420 samples were collected using randomizing software.

A causal comparison design was used to compare traditional 16-week, 8-week and 4-week course scheduling options and its effect on CTE course grades and CTE course completion. The Kruskal-Wallis H test was utilized to determine the statistical significance between three independent variables (scheduling option) and a dependent ordinal variable (grades, completion). Descriptive statistics were used to calculate the mean, standard deviation, and the range of variables. CTE course grades were given the following values for analysis: A = 5, B = 4, C = 3, D = 2, F = 1, W = 0. For course completion data analysis, frequency distribution was utilized. A course completed was given a value of 1, while a course not completed was given a value of 0.

Results

The current study examined the relationship between CTE course scheduling options and the effects on CTE student performance (grades) and CTE course completion. The CTE course scheduling options analyzed were the compressed schedules of 4-week and 8-week options, along with a traditional 16-week course option. The analysis showed there was a significant effect on student performance (grades), particularly in the 4-week scheduling option. A stratified random sampling strategy was utilized to select data collected in the form of CTE course letter grades and CTE course completion data from six community colleges in the South Texas region. The archival data for this quantitative study was gathered by analyzing grade distribution reports requested from the six identified institutions.

Based on SPSS descriptive statistical analysis, the course grade mean for N (420) was 4, with 5 being the 75th percentile. As shown in Table 1, there is a significant statistical difference in mean ranks of course grades based on scheduling options. Similarly, Table 2 provides descriptive statistics related to the effects of scheduling on course grades.

Table 1*Mean Ranks of Grades Based on Scheduling Options*

Course schedule format	<i>N</i>	Mean Rank
4 weeks	90	251.11
8 weeks	150	211.38
16 weeks	180	189.46
Total	420	

Table 2*Descriptive Statistics of Grades Based on Scheduling Options*

	<i>N</i>	<i>M</i>	<i>SD</i>	Min	Max	25th*	50th*	75th*
Course grade	420	4.00	1.756	0	5	4	4	5
Course schedule format	540	9.33	4.230	<.001	.000	4	8	16

*Percentiles

Inferential Statistics Results

The researcher utilized the Kruskal-Wallis Test with an alpha value of .05 to determine if there is a significant effect on student performance (grades) and CTE course completion based on CTE course scheduling options in six colleges in the South Texas region. The relationship between student performance (grades) and course scheduling options was significant, $X^2(2, N = 420) = 17.908, p < .001$. Based on the statistical results, the null hypothesis for RQ1 is rejected. As shown in Table 3, the statistical significance of the effect of compressed scheduling options in the form of 4-week and 8-week options on student performance was independently analyzed in RQ1 supplemental questions RQ1a, RQ1b and RQ1c. The statistical difference between student performance (grades) in a 4-week course schedule compared to a 16-week course schedule was significant, $X^2(2, N = 420) = 61.647, p = < .001$. Based on the statistical results, the null hypothesis for RQ1a is rejected. The statistical difference between student performance (grades) in an 8-week compressed course schedule compared to a 16-week course schedule was not significant, $X^2(2, N = 420) = 21.913, p = .079$. Based on the statistical results, the analysis fails to reject the null hypothesis for RQ1b. The statistical difference between student performance (grades) in a 4-week compressed course schedule compared to an 8-week compressed course schedule was significant, $X^2(2, N = 420) = 39.734, p = .008$. Based on the statistical results, the null hypothesis is rejected for RQ1c.

Table 3*Pairwise Comparisons of Course Schedule Format Based on Grades*

Sample 1 – Sample 2	Test statistic	<i>SE</i>	Standard test statistic	<i>P</i>
16 weeks – 8 weeks	21.913	12.480	1.756	.079
16 weeks – 4 weeks	61.647	14.573	4.230	<.001
8 weeks – 4 weeks	39.734	15.051	2.640	.008

Course Completion

The relationship between CTE course completion and course scheduling options was significant, $X^2(2, N = 420) = 9.708, p = .008$. Based on the statistical results, the null hypothesis for RQ2 is rejected. The statistical significance of the effect of compressed scheduling options in the form of 4-week and 8-week options on CTE course completion was independently analyzed in RQ2 supplemental questions RQ2a, RQ2b and RQ2c (see Table 4). The statistical difference between CTE course completion in a 4-week course schedule compared to a 16-week course schedule was significant, $X^2(2, N = 420) = 22.167, p = < .004$. Based on the statistical results, the null hypothesis for RQ2a is rejected. The statistical difference between CTE course completion in an 8-week compressed course schedule compared to a 16-week course schedule was significant, $X^2(2, N = 420) = 15.167, p = .023$. Based on the statistical results, the analysis fails to reject the null hypothesis for RQ2b. The statistical difference between CTE course completion in an 8-week compressed course schedule compared to a 4-week course schedule was not significant, $X^2(2, N = 420) = 7.00, p = .384$. Based on the statistical results, the analysis fails to reject the null hypothesis for RQ2c.

Table 4*Pairwise Comparisons of Course Schedule Format Based on Completion*

Sample 1 – Sample 2	Test statistic	<i>SE</i>	Standard test statistic	<i>P</i>
16 weeks – 8 weeks	15.167	6.668	2.275	.023
16 weeks – 4 weeks	22.167	7.786	4.230	<.001
8 weeks – 4 weeks	7.000	8.042	.870	.384

Recommendations and Conclusion

Community colleges, particularly Career Technical Education (CTE) programs, play an essential role in training a community's workforce and in the economic development of communities (Williams & Nourie-Manuele, 2018). Despite the advantages of accessibility,

community colleges struggle to meet the workforce demands of industry (Fuller & Raman, 2022). Consistent completion of CTE programs is needed to address the growing labor force of South Texas, which is expected to grow by 17% (TWC, n.d.b, p. 29). The results of this study identified the effects of course scheduling on CTE student performance (grades) and CTE course completion. The study's findings may aid in the strategic planning of community colleges' CTE instructional programs.

In analyzing the effects of 4-week, 8-week, and 16-week schedules on CTE courses, a 4-week schedule was found to have the most statistically significant effect on CTE courses. A 4-week schedule had statistically significant effects on both CTE student performance and CTE course completion compared to a traditional 16-week schedule and 8-week schedule formats. The results in Table 2 show that based on grade mean averages, a 4-week schedule had the highest mean average in comparison to 8-week and 16-week mean averages. Based on Table 3, a 4-week schedule produced the highest percentage of A letter grades compared to the scheduling options of 8-week and 16-week scheduling option.

In terms of CTE course completion, both 4-week and 8-week schedule formats have a statistically significant effect on course completion. The course schedule format that had the most effect on CTE courses based on the research analysis is the 4-week scheduling option. Based on Table 4, the 4-week and 8-week schedule options had the highest percentage of course completion compared to a traditional 16-week schedule option. The findings support the theoretical frameworks of Cognitive Load Theory and Experiential Learning discussed in the literature review. In a compressed schedule strategy, a student's cognitive load is reduced by only having to focus on one or two courses at once.

Recommendations

Research in CTE instructional programs has been limited, particularly in the effects of scheduling (Davidson et al., 2019; Holston, 2020; Howell et al., 2019). The current research highlighted the effect of compressed scheduling options of 4-week and 8-week on random CTE disciplines. The researcher recommends that further studies be conducted on CTE programs in higher education institutions. Researching the specific topics below may provide a strategic insight that can potentially improve the effectiveness of CTE programs.

Institutional leaders must be keen on the implications of implementing a compressed scheduling strategy at scale. It is critical for internal institutional stakeholders that may impact implementation and success of a compressed scheduling strategy be identified. An institutional implementation of a compressed schedule would require an increase in the operational cycles of student services to include financial aid, advising, registration, and facilities planning; these areas need to be included in preliminary discussion to ensure availability of resources. Since a compressed schedule strategy involves many institutional components, a pilot is recommended prior to full implementation. A recommendation that may facilitate this strategy is to formulate timelines, benchmarks, and goals. Goals should be both short term and long term, any potential barriers should also be identified in the planning stages of the project. A potential benefit of a compressed scheduling strategy is the continual enrollment of students that may increase student output. An increase in student output to address the needs of industry, will cause an increase in resources required for CTE programs.

Conclusion

The research focused on six colleges in the South Texas region and involved only CTE courses. The implementation of a compressed scheduling strategy in CTE programs may allow higher education institutions in Texas to capitalize on the state's new community college funding model which is focused on outcome-based performance (Texas Higher Education Coordinating Board, n.d.). An increase in the completion of degrees, certificates and other short-term credentials will increase the funding for an institution. It is recommended that similar research be conducted at individual institutions to statistically assess the effect of scheduling on their respective CTE programs. Incorporating the recommended practices outlined in this research may aid leaders in maximizing the efficiency and overall effectiveness of a compressed scheduling strategy.

Community colleges will continue to be critical in providing a trained workforce to their respective communities. The Texas legislature's recent passage of House Bill 8 validated the importance of community colleges in supplying a trained workforce. This law will enhance the role of community colleges in preparing students for high-demand careers. Institutional leaders must focus on the efficacy of CTE program delivery to maximize the benefit of the state's new strategic funding. This study examined 4-week, 8-week, and 16-week scheduling options in CTE programs. The Researcher found that a 4-week compressed schedule produced the most statistically significant effect on CTE student performance (grades) and CTE course completion. Community college leaders need to be cognizant that the implementation of a compressed schedule strategy will prompt programmatic and institutional changes. These changes may include new demands for financial and personnel resources to facilitate changes in scheduling formats. The findings in this study along with the recommendations for practice may provide leaders with a framework for similar institutional specific research and strategy implementation.

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