What Do They Do Different? A Comparison of Practices at Award Winning Technology Centers That Work and Non-Award Winning Centers:

Abstract

Objective: The purpose of this study was to determine characteristics of award winning Career and Technical Centers that may contribute to best practices in the integration of core academic concepts into the Career and Technical Education (CTE) curriculum. These responses were compared to non-award winning schools in order to determine what award winning schools may have done differently that could have contributed to their success. Background: It is widely accepted that educators should place an increased emphasis on workforce readiness in secondary education to prepare students for a global economy that is becoming increasingly complex and knowledge-based. New participants must enter our nation’s workforce, properly equipped with the applied skills and knowledge to remain competitive throughout the twenty-first century. Methods: A researcher-developed questionnaire was used to collect data for this study. The questionnaire was based on related literature concerning integrating academic concepts into the CTE curriculum. Results: The data indicated that participants at award-winning schools perceived their school’s integration practices to be much more successful than these at non-award-winning schools in presage, process, and context variables. Conclusion: This study proved to be consistent with much of the previously published body of literature concerning the integration of academics into the context of CTE and the value of properly supported and educated teachers and administrators. Application: The results do imply that previous researchers and practitioners were correct in their assumptions that an integrated CTE curriculum leads to higher student achievement.
Introduction

It is widely accepted that educators should place an increased emphasis on workforce readiness in secondary education to prepare students for a global economy that is becoming increasingly complex and knowledge-based (McIlvaine, 2015). New participants must enter our nation’s workforce, properly equipped with the applied skills and knowledge to remain competitive throughout the twenty-first century (The Conference Board, 2006). To even further complicate the current dilemma, researchers have found high school students to be deficient in problem-solving and critical thinking skills. Subsequently, the implementation of high-quality career and technical education (CTE) programs can help fulfill this requirement (Gordon, 2008).

Literature Review

While researchers agree that a curriculum that presents core academic subjects such as conceptual mathematics, science, and language arts in a more practical context allows students to grasp and value these important skills, there continues to be a problem. Ideally, the rigor of core academics should merge with the relevance of CTE yet the challenge to do so remains the focus of many CTE participants (Stone, Alfeld, Pearson, Lewis, & Jenson, 2006).

To further exacerbate the division, many school systems have created and nurtured a historically grounded dual-system of education, in which the core academics of mathematics, language arts, science, and social science have been completely separated from CTE. These traditional structures have proven difficult in maintaining reciprocal operation and collaboration. What is more, collegiality between these two groups has been difficult to establish and maintain. This situation has been very problematic and students have suffered because of these differences. These problems, in turn, have contributed to students being ill-prepared for both higher-education and the workforce (Grubb, Davis, Lum, Plihal, & Morgaine, 1991).
To help combat this problem, the Southern Regional Educational Board (SREB) initiated efforts to help ensure that students who were enrolled in secondary career and technical education were properly prepared to enter the workforce (Gordon, 2008). This initiative began in 1985 as the “High Schools that Work” program that promoted curriculum integration between career and technical programs and other emphases of learning that had traditionally been termed “academic” e.g. mathematics, language arts, and sciences. The High Schools that Work (HSTW) eventually gave way to the more recent Technology Centers that Work (TCTW) initiative (Southern Regional Educational Board [SREB], 2014).

According to the Southern Regional Education Board, schools that placed a high emphasis on integrated academics and CTE programs have significantly higher student achievement levels in science, math, and reading than schools that do not place an emphasis on the integrated approach (Bottoms, Presson, & Han, 2004). As Hyslop (2007) explained,

Integration of academic competencies into career and technical education curricula and of real-world content and applied methods and examples into traditional classes can raise student achievement levels an increasing understanding of rigorous content. (p. 40)

To help guide these academic integration endeavors, the TCTW initiative has identified a set of key practices that they deemed to contribute to the improvement of student preparedness for college and future career success. According to TCTW, these key practices include:

**High Expectations:** Motivate more students to meet high expectations by integrating high expectations into classroom practices and giving students frequent feedback.

**Program of Study:** Require each student to complete a plan of study leading them to complete a true concentration in an approved sequence of at least four career-technical (CT) courses and an upgraded academic core leading to preparation for post-secondary
studies and a career. **Academic Studies:** Teach more students the essential concepts of the college-preparatory curriculum by encouraging them to apply academic content and skills to real-world problems and projects within their CT studies. **CT Studies:** Provide more students access to intellectually challenging CT studies in high-demand fields that emphasize higher-level mathematics, science, literacy, and problem-solving skills needed in the workplace and in further education. **Work-Based Learning:** Enable students and their parents to choose from programs that integrate challenging high school CT studies and work-based learning and are planned by educators, employers and students. **Teacher Collaboration:** Provide cross-disciplinary teams of teachers the time and support to work together to help students succeed in challenging CT and academic studies. **Students Engagement:** Engage students in CT and academic classrooms in rigorous and challenging assignments using research-based strategies and technology. **Guidance:** Involve students and their parents in a guidance and advisement system that develops positive relationships and ensures completion of a CT concentration with an approved sequence of at least four courses and an accelerated program of study. **Extra Help:** Provide a structured system of extra help to assist students in completing accelerated programs of study with high-level academic and technical content. **Culture of Continuous Improvement:** Use student assessment, program evaluation data, technology center performance reports, program enrollment, retention and placement reports, college remediation reports, student follow-up reports and advisory committee input to continuously improve school culture, organization, management, curriculum and instruction to advance student learning. (SREB, 2014)
As a way to promote the development of successful CTE programs, TCTW recognizes bi-annually its member schools that achieve award-winning status with several distinctions which include TCTW Platinum High Achievement status, TCTW Gold Readiness status, the TCTW Gold Improvement Award, and the 15 Most Improved TCTW Centers. Each of these awards take into consideration accomplishments and performance of students, the overall plan of the Career Technical Center (CTC) concerning implementation of the TCTW model, and student perceptions of the quality of instructional programming.

**Theoretical Framework**

The theoretical framework for this research study was based on Dunkin and Biddle’s (1974) model for classroom teaching (see Figure 1). Dunkin and Biddle’s model outlined variables that influence student learning outcomes. The model focused on four major variable components: presage, context, process, and product. The arrows in the model represent contributory relationships (e.g., teacher training experiences influence teacher behavior). The variable components in the model are placed in a particular order. The order also represents relationships (e.g., teacher formative experiences influence and occur first or in conjunction with teacher training experiences) (Dunkin & Biddle, 1974).
Presage variables center on teacher characteristics. These teacher variables consist of formative experiences, teacher training experiences (pre-service and in-service), teaching characteristics, and personal characteristics (Dunkin & Biddle, 1974).

Context variables involve learner experiences along with the many variables to which the teacher must adjust. The context variables include formative learner experiences, learner characteristics, personality traits, school and community characteristics, and classroom characteristics (Dunkin & Biddle, 1974).

Process variables regard occurrences in the classroom. These are the actual activities that take place in the classroom. Process variables consist of observable changes in teacher and...
learner behaviors. Process variables involve teacher-learner interactions. Examples of occurrences and behaviors in the classroom include classroom management techniques and a teacher’s dislike for a particular student (Dunkin & Biddle, 1974).

Product variables are the last variable in Dunkin and Biddle’s (1974) model. Product variables concern outcomes in the teaching and learning process. Product variables represent changes that occur in learners as a result of involvement in the classroom through interaction with the teacher and other learners. Product variables consist of student learning, learner skills gained, and attitudes developed and modified (Dunkin & Biddle, 1974).

Product variables were defined for the purpose of this study as the dichotomous differentiation between centers that achieved the Platinum High Achievement, Gold Readiness, Gold Improvement, or Most Improved Centers and those who did not receive awards. In order to obtain award-winning status, schools were required to meet criteria including high or increased mean scores in reading, mathematics, and science on the 2012 HSTW Assessment. They must also have completed the recommended curriculum, attained the readiness goals, and attained guidance and advisement goals (SREB, 2012). For the purpose of this study, the product variables were treated as dependent variables to compare the presage, context, and process variables as independent variables and measure the possible relationships.

**Purpose of the Study**

The purpose of this study was to determine characteristics of award winning CTCs that are members of the TCTW consortium that may contribute to best practices in the integration of core academic concepts into the CTE curriculum. These responses were compared to non-award winning schools in order to determine what award winning schools may have done differently that could have contributed to their success.
**Research Question**

This study was designed to answer the following research question:

1. Did representatives from award-winning and non-award-winning schools perceive significant differences concerning presage, process, and context variables at their schools as compared to the non-award winning group?

**Null Hypothesis**

To test the research question, the null hypothesis stated that there were no statistically significant differences between the award-winning TCTW schools and non-award-winning TCTW schools, specifically concerning selected presage, context, and process variables.

**Methods**

At the time of this study, the TCTW consortium was comprised of 166 schools in 17 states in the United States. The researchers sought to obtain participants from all of these schools. Since this research study was quasi-experimental in nature, the results are not generalizable to any other group or situation (Ross & Shannon, 2008). Participants were invited to participate in the study and asked to forward the invitation to the Career and Technical faculty at their schools. A link to the survey was provided in the email invitation. The surveys were administered through the Qualtrics online platform.

A researcher-developed questionnaire was used to collect data for this study. The questionnaire was based on related literature concerning integrating academic concepts into the CTE curriculum. In order to accurately describe best practices of curriculum integration, questions from the following categories were formulated:

1. Describe how to properly prepare CTE teachers to become effective curriculum integrators through pre-service and in-service experiences (presage variables)
2. Describe how to properly prepare learners to improve achievement through curriculum integration (context variables).

3. Describe how to properly integrate core academic concepts into CTE curriculum for maximum student achievement (process variables).

From the related literature, a questionnaire consisting of questions in each of the three categories (a total of 39 questions) mentioned above were developed for the panel. Example items from the presage variable category of the questionnaire included items such as the continual use of collected data to evaluate program curriculum, instruction, and student success and sufficient professional development to enable academic integration into CTE programs. Example items from the context variable category of the questionnaire included items such as the cooperating feed school sets high expectations for their students and the majority of the students at the CTE school have a genuine interest in the subject matter. Example items from the process variable category of the questionnaire included items such as students capability to earn dual credit at the CTE school and the assignment of weekly homework at the CTE school.

The survey questionnaires were sent to the participants by e-mail to each of the 166 selected schools. The link contained specific instructions to the respondent: a means of not participating in the study if they wished not to, and a method of submitting the completed survey. Also contained in the initial e-mailing was an information letter which clearly described the purpose of the study and explained why the potential participant's opinion was being sought. Questions were categorized into three categories: teachers at my school (presage variables), teaching and learning (process variables), and students in my school (context variables).

There were 13 CTE administrators and 63 teachers that participated in the award-winning group, along with 66 CTE administrators and 69 teachers that participated in the comparison
group (non-awardwinning). The participants were asked to rate various factors on a four-point Likert-type scale with 1 = strongly disagree, 2 = disagree, 3 = agree, and 4 = strongly agree on most questions. This scale was be used to determine each participant’s level of agreement on each statement in the three categories. The Likert scale was developed to assess people’s attitudes toward a certain subject (Leedy & Ormrod, 2005).

The content validity of the instrument was determined by asking a group of experts, CTE participants, to assess. Recommended modifications were made to the instrument before distribution.

Dillman’s Tailored Design Method (Dillman, 2007) was utilized to solicit responses and to maximize responses. The researcher used concepts from Dillman’s Tailored Design Method to solicit responses. The prescribed steps in this model included a pre-notice email one week prior to the email containing the questionnaire link, a second email containing an informative letter and the link to the questionnaire, a follow-up reminder and thank you email, and four weeks later, a repetitive informative letter and link email to reach non-respondents, and a last notice email sent eight weeks after the initial email.

**Subject Selection**

For the award-winning group, the population for this study was award-winning schools (Platinum High Achievement Award, Gold Readiness Award, Gold Improvement Award, and the 15 most improved CTCs) that are a part of the TCTW consortium, a forum of the SREB. Award winning status was based on student achievement data from the success on the HSTW Assessment and responses from teacher surveys. Seniors at these schools are tested toward the end of the spring semester on even-numbered years (2008, 2010, 2012, etc.). The HSTW Assessment consists of three separately-timed sections which include a reading test, a
mathematics test, and a science test. Subjects were solicited to participate in the research study as representatives from award-winning schools as well as non-award winning schools who served as a comparison group. There were 18 schools that were identified as award-winning schools and 148 schools in the comparison group. The electronic survey instrument was sent to administrators in each of the schools along with instructions to forward the instrument to teachers in their school.

**Data Collection**

The survey questionnaires were sent to the participants by e-mail to each of the 166 selected schools. The link contained specific instructions to the respondent: a means of not participating in the study if they wished not to, and a method of submitting the completed survey. Also contained in the initial e-mailing was an information letter which clearly described the purpose of the study and explained why the potential participant’s opinion was being sought.

From the 166 TCTW schools that received emailed survey links in the study, a total of 211 surveys were received. This total is higher than the total of schools participating because the initial recipients were asked to forward the link to others involved in academic and career and technical integration in their school. A total of 135 surveys were received from participants at schools that were classified as non-award-winning and 76 surveys were received from participants at award-winning schools. Representatives from 13 out of 18 award-winning schools participated in the study for a 72 percent response rate. Representatives from 66 out of the 148 comparison schools provided data for the comparison.

**Data Analysis**

The data were examined to determine the mean scores of both the award-winning and the non-award-winning administrators. By using a four-point Likert scale with 1 = strongly disagree,
2 = disagree, 3 = agree, and 4 = strongly agree, the researcher was able to rate each group’s perceptions on how well integration variables are implemented at their schools. The means for each of the variables were compared between the groups via t-tests with Eta Squared used as a statistic that measures the proportion of variance associated with the individual effects to determine effect magnitude.

**Findings**

Questions were categorized into three categories: teachers at my school (presage variables), teaching and learning (process variables), and students in my school (context variables).

Research Question- Do participants from award-winning and non-award-winning schools report different levels of presage, process, and context, variables at their schools?

Table one describes the summary of scales for the constructs. Each of the scales (presage, process, and context) reached statistical significance with three of the mean scores being considerably higher for the award-winning participants compared to the non-award-winning participants. Award-winning participants indicated a mean score in the presage category of 3.27 and the non-award-winning participants had a mean score of 2.98. Award winners expressed a mean in the process category of 3.35 while the non-award-winners had a mean of 3.13. Finally, the award-winning participants group had a 0.35 higher mean than the non-award-winning participants in the context category. The award-winners had a mean of 3.48 and the non-award-winners had a mean of 3.14. While the effect sizes for each of the differences were relatively low, the context variable did reach a medium effect size (Ross & Shannon, 2008).
Table 1. Summary of Constructs

<table>
<thead>
<tr>
<th></th>
<th>Award-Winning Participants</th>
<th>Non-Award-Winning Participants</th>
<th>F</th>
<th>Sig.</th>
<th>Eta. Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presage</td>
<td>3.27 (0.30)</td>
<td>2.98 (0.44)</td>
<td>4.22</td>
<td>.044</td>
<td>.055</td>
</tr>
<tr>
<td>Process</td>
<td>3.35 (0.33)</td>
<td>3.13 (0.33)</td>
<td>4.34</td>
<td>.041</td>
<td>.058</td>
</tr>
<tr>
<td>Context</td>
<td>3.48 (0.27)</td>
<td>3.14 (0.31)</td>
<td>12.28</td>
<td>.001</td>
<td>.149</td>
</tr>
</tbody>
</table>

Presage Variables

Table two shows the perceptions of participants and reports the mean differences of award-winning and non-award-winning groups. Concerning presage variables, the perceptions were arranged with the differences between the means from greatest to least. The table shows that participants at award-winning TCTW schools felt that the teachers at their CTE schools were continually learning and seeking new ideas on how to improve instruction at a mean of 0.65.
higher than the participants at non-award-winning schools. Participants at award-winning TCTW schools also believed that there was an intensive emphasis on continuous improvement at their CTC and the teachers at their CTE school used data continuously to evaluate their program’s curriculum, instruction, and student success. Each of these questions had a mean of 0.43 higher than the comparison participants’ collective response. Participants at award-winning TCTW schools felt that Teachers and the CTE Administrator at their schools work as a team to improve student achievement at a 0.41 higher mean than participants at non-award-winning schools. Participants at award-winning schools also expressed that the teachers have had sufficient professional development to integrate academics into their CTE program at a rate of 2.27 compared to the 1.95 rate of their counterparts. This resulted in a 0.32 difference. The two group z test was used to compare the groups since the standard deviation for each group was known (Ross & Shannon, 2008).

Table 2 Presage Variables

<table>
<thead>
<tr>
<th>Individual Variables</th>
<th>Award Winning</th>
<th>Non-Award Winning</th>
<th>Difference Between Award Winning Groups</th>
<th>Difference Between Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers at my CTE school are</td>
<td>2.73</td>
<td>2.08</td>
<td>.55</td>
<td>.65</td>
</tr>
</tbody>
</table>

continually learning and seeking new ideas on how to improve instruction
There is an intensive emphasis on continuous improvement at my CTE school.

Teachers at my CTE school use data continuously to evaluate their program’s curriculum, instruction, and student success.

Teachers at my CTE school have had sufficient professional development to integrate academics into their CTE program.

Teachers at my CTE school often spend evenings and/or weekends working with their students.

Teachers at my CTE school maintain a demanding yet supportive environment that pushes students to do their best.

CTE teachers and academic teachers are given mutual
planning time for collaboration throughout the school year

Teachers at my CTE school often attend students extracurricular activities

Teachers at my CTE school are active listeners to their students’ concerns

I provide periodic feedback to my teachers to help instruction at my CTE school

CTE teachers and academic teachers work well together

<table>
<thead>
<tr>
<th></th>
<th>1.64</th>
<th>0.81</th>
<th>1.46</th>
<th>0.79</th>
<th>0.18</th>
<th>0.23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers at my CTE school</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.27</td>
<td>0.47</td>
<td>2.15</td>
<td>0.62</td>
<td>0.12</td>
<td>0.19</td>
</tr>
<tr>
<td>Teachers at my CTE school are active listeners to their students’ concerns</td>
<td>2.55</td>
<td>0.52</td>
<td>2.45</td>
<td>0.53</td>
<td>0.10</td>
<td>0.19</td>
</tr>
<tr>
<td>I provide periodic feedback to my teachers to help instruction at my CTE school</td>
<td>2.25</td>
<td>1.73</td>
<td>0.69</td>
<td>2.15</td>
<td>0.10</td>
<td>0.73</td>
</tr>
</tbody>
</table>

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283 **Process Variables**

284 Table three displays the results of the perceptions of participants concerning process variables and reports the mean differences of award-winning and non-award-winning groups from greatest to least. Table three indicates that participants at award-winning TCTW schools estimate the participation of their students earning post-secondary college credit (dual enrollment) was far above what those at non-award-winning schools estimated in their schools.

288 In fact, there was a 2.32 difference in the means of these responses. This difference was by far the largest difference in the entire data set. Comparison group participants reported that the teachers at their schools gave homework at a higher mean rate of 1.66 than award-winning
schools, which had a 1.00 mean. Participants at award-winning schools also estimated that there was a much higher number of students earning employability credentials indicated by a mean difference of 0.53 when compared to the estimates reported at the non-award-winning schools.

Table three also expressed a difference in the perceptions of participants at award-winning schools on their students being given multiple opportunities to learn content at a mean rate of 0.39 higher than those at the non-award-winning schools. Award winning schools provided their students with intellectually demanding studies that emphasized science at a mean rate 0.33 higher than non-award-winning schools.

A strong emphasis was placed on certain teaching and learning methods at each of these school groups. The comparison participants indicated that teacher demonstrations, group projects, teacher presentations, and discussions are the top four methods in their schools. In contrast, the principals at award-winning TCTW schools pointed out that student presentations was their schools’ most popular method with teacher demonstrations, group projects, and discussions rounding out the top four.

Table 3

Teaching and Learning Characteristics, Process Variables

| Individual Variables | Award-Winning Mean | Award-Winning SD | Non-Award-Winning Mean | Non-Award-Winning SD | Difference Between Groups Mean | Difference Between Groups Z |
Students at my CTE school earn post-secondary college credit (dual enrollment)

|                           |   4.45 |  1.81 |  2.13 |  1.67 |  2.32 |  1.39 |

Teachers at my CTE school assign homework each week.

Students at my CTE school earn employability credentials each year

|                           |   1.00 |  1.04 |  1.66 |  1.06 |  0.66 | -0.62 |

Students at my CTE school are given multiple opportunities to learn content

|                           |  2.73  |  0.47 |  2.34 |  0.54 |  0.39 |  0.72 |

Students at my CTE school are provided with intellectually demanding studies that emphasize science

|                           |  2.18  |  0.40 |  1.85 |  0.66 |  0.33 |  0.50 |

Students at my CTE school are commonly allowed to develop their own assignments

|                           |  2.27  |  0.47 |  2.00 |  0.52 |  0.27 |  0.52 |

Teachers at my CTE school place great emphasis on the use of technology

|                           |  2.55  |  0.52 |  2.30 |  0.59 |  0.25 |  0.42 |
Students at my CTE school are provided with intellectually demanding studies that emphasizes math.

Teachers at my CTE school give extra help to students outside of class time.

CTE Student Organizations are strongly emphasized at my CTE school.

Students at my CTE school are provided with intellectually demanding studies that emphasizes literacy.

A strong emphasis is placed on these teaching and learning methods at my CTE school.

|                          | Mean | SD  | Media | Median | |   | |   | |   |
|--------------------------|------|-----|-------|--------|---|---|---|---|---|
| **Student Presentations**| 2.55 | .52 | 2.02  | .62    | .53 | .85|
| **Student Research**     | 2.18 | .60 | 1.78  | .63    | .40 | .62|

CTE Student Organizations (FBLA, FFA, HOSA, SkillsUSA, TSA, etc.) activities are strongly emphasized at my CTE school.
<table>
<thead>
<tr>
<th>Context Variables</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Discussions</td>
<td>2.45</td>
<td>.69</td>
<td>2.25</td>
<td>.60</td>
<td>.20</td>
</tr>
<tr>
<td>Lecture</td>
<td>1.64</td>
<td>.67</td>
<td>1.85</td>
<td>.75</td>
<td>.21</td>
</tr>
<tr>
<td>Students Sharing in Small Groups</td>
<td>2.36</td>
<td>.50</td>
<td>2.18</td>
<td>.65</td>
<td>.18</td>
</tr>
<tr>
<td>Group Projects</td>
<td>2.45</td>
<td>.52</td>
<td>2.31</td>
<td>.62</td>
<td>.14</td>
</tr>
<tr>
<td>Students Viewing Videos</td>
<td>1.80</td>
<td>.79</td>
<td>1.72</td>
<td>.55</td>
<td>.08</td>
</tr>
<tr>
<td>Teacher Demonstrations</td>
<td>2.45</td>
<td>.69</td>
<td>2.51</td>
<td>.50</td>
<td>.06</td>
</tr>
<tr>
<td>Teacher Presentations</td>
<td>2.27</td>
<td>.65</td>
<td>2.26</td>
<td>.51</td>
<td>.01</td>
</tr>
</tbody>
</table>

Table four described perceptions concerning context variables. The mean differences of award-winning and non-award-winning groups were arranged from greatest to least in table four. Participants at award-winning TCTW schools indicated there was a much higher number of students completing a career exploration course before they enrolled in the CTC. In fact, the mean rate at award-winning schools was 1.00 higher than the other group. This figure is second greatest difference in all of the variables on the administrator questionnaire. Participants at award-winning TCTW schools also estimated that the students on a free or reduced lunch rate was much different than the mean estimation of the non-award-winning schools, a 0.72 difference. The goals and priorities were clearly communicated at award-winning schools at a mean rate of 0.46 higher and students were perceived to have the math skills they needed to
succeed at the CTC at a mean rate of 0.40 higher at the award-winning-schools when compared to the other group.

Table 4. Context Variables

<table>
<thead>
<tr>
<th>Individual Variables</th>
<th>Award Winning</th>
<th>Non-Award Winning</th>
<th>Difference Between Group Means</th>
<th>Difference Between Groups Means</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most students have completed a career exploration course in the past.</td>
<td>4.05</td>
<td>3.05</td>
<td>1.00</td>
<td>.59</td>
<td></td>
</tr>
<tr>
<td>A substantial number of students at my CTE school receive free or reduced lunch.</td>
<td>2.45</td>
<td>3.17</td>
<td>1.08</td>
<td>.72</td>
<td>-.67</td>
</tr>
<tr>
<td>The goals and priorities at my CTE school are clearly communicated.</td>
<td>2.82</td>
<td>2.36</td>
<td>.55</td>
<td>.46</td>
<td>.84</td>
</tr>
<tr>
<td>Students have the math skills to succeed at my school.</td>
<td>2.00</td>
<td>1.60</td>
<td>.49</td>
<td>.40</td>
<td>.82</td>
</tr>
<tr>
<td>The feeder school(s) for my CTE school set high expectations for their students.</td>
<td>2.18</td>
<td>1.81</td>
<td>.63</td>
<td>.37</td>
<td>.59</td>
</tr>
</tbody>
</table>
Students have the technological skills to succeed at my school.
The administration at my CTE school has high expectations for students to achieve college and career readiness.
A majority of the students at my CTE school have a genuine interest in the subject matter being taught.
Students are required to work in teams at my CTE school develop their own assignments
Students have the science skills to succeed at my school
Students get the guidance counseling they need to transition to college and career while at my CTE school
Students have the literacy skills to succeed at my school

<table>
<thead>
<tr>
<th>Description</th>
<th>Score 1</th>
<th>Score 2</th>
<th>Score 3</th>
<th>Score 4</th>
<th>Score 5</th>
<th>Score 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students have the technological skills to succeed at my school</td>
<td>2.40</td>
<td>.52</td>
<td>2.05</td>
<td>.39</td>
<td>.35</td>
<td>.90</td>
</tr>
<tr>
<td>The administration at my CTE school has high expectations for students to achieve college and career readiness</td>
<td>3.00</td>
<td>0</td>
<td>2.65</td>
<td>.48</td>
<td>.35</td>
<td>.73</td>
</tr>
<tr>
<td>A majority of the students at my CTE school have a genuine interest in the subject matter being taught</td>
<td>2.73</td>
<td>.47</td>
<td>2.39</td>
<td>.56</td>
<td>.34</td>
<td>.61</td>
</tr>
<tr>
<td>Students are required to work in teams at my CTE school develop their own assignments</td>
<td>2.28</td>
<td>.30</td>
<td>2.00</td>
<td>.52</td>
<td>.28</td>
<td>.54</td>
</tr>
<tr>
<td>Students have the science skills to succeed at my school</td>
<td>1.91</td>
<td>.54</td>
<td>1.67</td>
<td>.47</td>
<td>.24</td>
<td>.51</td>
</tr>
<tr>
<td>Students get the guidance counseling they need to transition to college and career while at my CTE school</td>
<td>2.18</td>
<td>1.17</td>
<td>1.97</td>
<td>.78</td>
<td>.21</td>
<td>.27</td>
</tr>
<tr>
<td>Students have the literacy skills to succeed at my school</td>
<td>2.00</td>
<td>.45</td>
<td>1.80</td>
<td>.45</td>
<td>.20</td>
<td>.44</td>
</tr>
</tbody>
</table>
Conclusions

The data indicated that participants at award-winning schools perceived their school’s integration practices to be much more successful than these at non-award-winning schools in presage, process, and context variables. The data also indicated that award-winning participants perceived that nearly all of their schools’ presage integration practices were better when compared to non-award-winning participants’ perceptions.

The perceptions of participants at award-winning TCTW schools indicated that the teachers at their CTC are continually learning and seeking new ideas on how to improve instruction at a higher level than the participants at non-award-winning schools. Participants at award-winning TCTW schools also believed that there was an intensive emphasis on continuous improvement at their CTC and the teachers at their CTE school used data continuously to evaluate their program’s curriculum, instruction, and student success. Each of the questions had a mean higher than the non-award-winning participants’ collective responses. Participants at award-winning TCTW schools felt that teachers and the CTE administrator at their schools worked as a team to improve student achievement at a higher rate than participants at comparison schools. Participants at award-winning schools also expressed that the teachers at their CTC had sufficient professional development to integrate academics into their CTE program at a higher rate than their counterparts.

Participants at non-award-winning TCTW schools responded with a mean of 2.45 while award-winning participants’ collective mean was 2.55 on the question that stated, Participants provide periodic feedback to my teachers to help instruction at my CTC. This showed that participants at award-winning schools perceived that their schools were 0.10 better on the mean than non-participants’ perceptions. The next statement on the survey was, teachers at my CTC
maintain a demanding yet supportive environment that pushes students to do their best. Again, participants at award-winning TCTW schools exhibited better mean scores, than the other participants’ group. A 2.25 mean was recorded for the award-winning participants’ perception and a 2.15 for the non-award-winning group for the statement, CTE teachers and academic teachers work well together. Award-winning schools were 0.10 better in regards to the mean. Principals at award-winning TCTW schools had an average of 2.27 on the statement, teachers at my CTE school are active listeners to their students’ concerns, while the non-award winning group had a mean of 2.15. This exhibited a 0.12 difference in favor of the award-winning schools.

Participants at non-award-winning TCTW schools responded with a mean of 1.46 while award-winning participants’ collective mean was 1.64 on the question that stated, teachers at my CTC often attend students’ extracurricular activities, a difference of 0.18. According to participants, teachers at award-winning TCTW schools often spend evenings and/or weekends working with their students at a mean of 1.73 compared to a non-award-winning mean of 1.42, a difference if 0.31 in favor of the award-winners. The next statement on the survey was CTE teachers and academic teachers were given mutual planning time for collaboration throughout the school year. The non-award-winning mean was higher in this case as well. A 1.61 mean compared to a 1.35 mean from the non-award-winners.

When teaching and learning or process variables were analyzed, it was determined that participants at award-winning TCTW schools estimated their students were earning post-secondary college credit (dual enrollment) at a rate far above what participants at non-award-winning schools estimated at their schools. Participants at award-winning schools also estimated that there was a much higher number of their students earning employability credentials when
compared to the estimates at the non-award-winning schools. Table three also expressed a
difference in the perceptions of participants at award-winning schools on their students being
given multiple opportunities to learn content at a mean rate of 0.39 higher than those at the non-
award-winning schools. Award winning schools provided their students with intellectually
demanding studies that emphasized science at a higher rate than non-award-winning schools.

A strong emphasis was placed on certain teaching and learning methods at each of these
school groups. The non-award winning participants indicated that teacher demonstrations, group
projects, teacher presentations, and discussion are the top four methods in their schools. In
contrast, the principals at award-winning TCTW schools pointed out that students sharing in
small groups was their school’s most popular method with teacher demonstrations, group
projects, and discussions rounding out the top four.

The data from the context variables for participants at award-winning TCTW schools
indicated that there was a higher number of students completing a career exploration course
before they enrolled in the CTC. Participants at award-winning TCTW schools also estimated
that the percentage of students on a free or reduced lunch rate was different than the mean
estimation of the non-award-winning schools. The goals and priorities were clearly
communicated at award-winning schools at a mean rate of 0.46 higher and students were
perceived to have the math skills needed to succeed at the CTC at a mean rate of 0.40 higher at
the award-winning schools when compared to the other group.

**Discussion and Implications**

This study proved to be consistent with much of the previously published body of
literature concerning the integration of academics in to the context of CTE. The results do imply
that previous researchers and practitioners (Bottoms et. al, 2004; Hyslop, 2007; Stone et. al,
2006) were correct in their assumptions that an integrated CTE curriculum leads to higher student achievement. Findings in this study were consistent with the stance taken by Hyslop (2007), “Integration of academic competencies into career and technical education curricula and of real-world content and applied methods and examples into traditional classes can raise achievement levels and increasing understanding of rigorous content” (p. 40). Responses from award-winning participants and teachers indicate that schools that are doing a better job of integrating academics into the CTE curriculum are producing students that are outperforming others on the HSTW Assessment.

This study also helps to support claims made by SREB (2014) that TCTW key practices contribute significantly to the improvement of student preparedness for college and future career success. The TCTW key practices of setting high expectations for students, integrating rigorous academic competencies into the context of CTE, focusing on teacher collaboration in cross-disciplinary teams, involving students in a comprehensive guidance, providing students with extra system of getting extra help in completing accelerated assignments, and creating a culture of continuous improvement did prove to provide a significant increase in student performance on the HSTW Assessment.

CTCs in the United States should continue to seek better ways of integrating academics into the context of real-world learning experiences in CTE. The SREB continues to make a positive impact on preparing students for college and career readiness through the recommended practices of the TCTW Initiative. Local education agencies should embrace the powerful role of CTE to help students become prepared for life after high school.
Recommendations

This study indicated that certain integration practices seemed to increase the likelihood of students in TCTW schools achieving award winning status while others do not. The data seemed to also indicate that award-winning and non-award-winning TCTW schools were basically doing the same things in the process of classroom and laboratory learning experiences. However, the presage practices (teacher behaviors, learner variables, and changes in behavior) and the context practices of the learners (formative experiences, learner characteristics, personality traits, school and community characteristics, and classroom characteristics) showed a significant difference at award-winning TCTW schools when compared to the non-award winning schools.

Like other research studies, findings from this study raise questions for further research, however, schools that are members of the TCTW consortium that desire to become an award-winning school should consider placing a stronger emphasis on presage and context variables as indicated in this study. It would stand to reason that the presage variables could be most readily addressed through in-service experiences such as curriculum integration workshops and projects to build communities of practice among teachers. Programs available to teachers through the National Research Center for Career and Technical education concerning curriculum integration such as the Math-in-CTE project could be implemented to achieve this goal.
References


Southern Regional Education Board. (2012). Embedding the common core state standards or other rigorous standards into the academic, career/technical and elective courses. Southern Regional Education Board (SREB).

