

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

3
4 **Abstract**

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

24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46

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).

47 To help combat this problem, the Southern Regional Educational Board (SREB) initiated
48 efforts to help ensure that students who were enrolled in secondary career and technical
49 education were properly prepared to enter the workforce (Gordon, 2008). This initiative began in
50 1985 as the “High Schools that Work” program that promoted curriculum integration between
51 career and technical programs and other emphases of learning that had traditionally been termed
52 “academic” e.g. mathematics, language arts, and sciences. The High Schools that Work (HSTW)
53 eventually gave way to the more recent Technology Centers that Work (TCTW) initiative
54 (Southern Regional Educational Board [SREB], 2014).

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

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

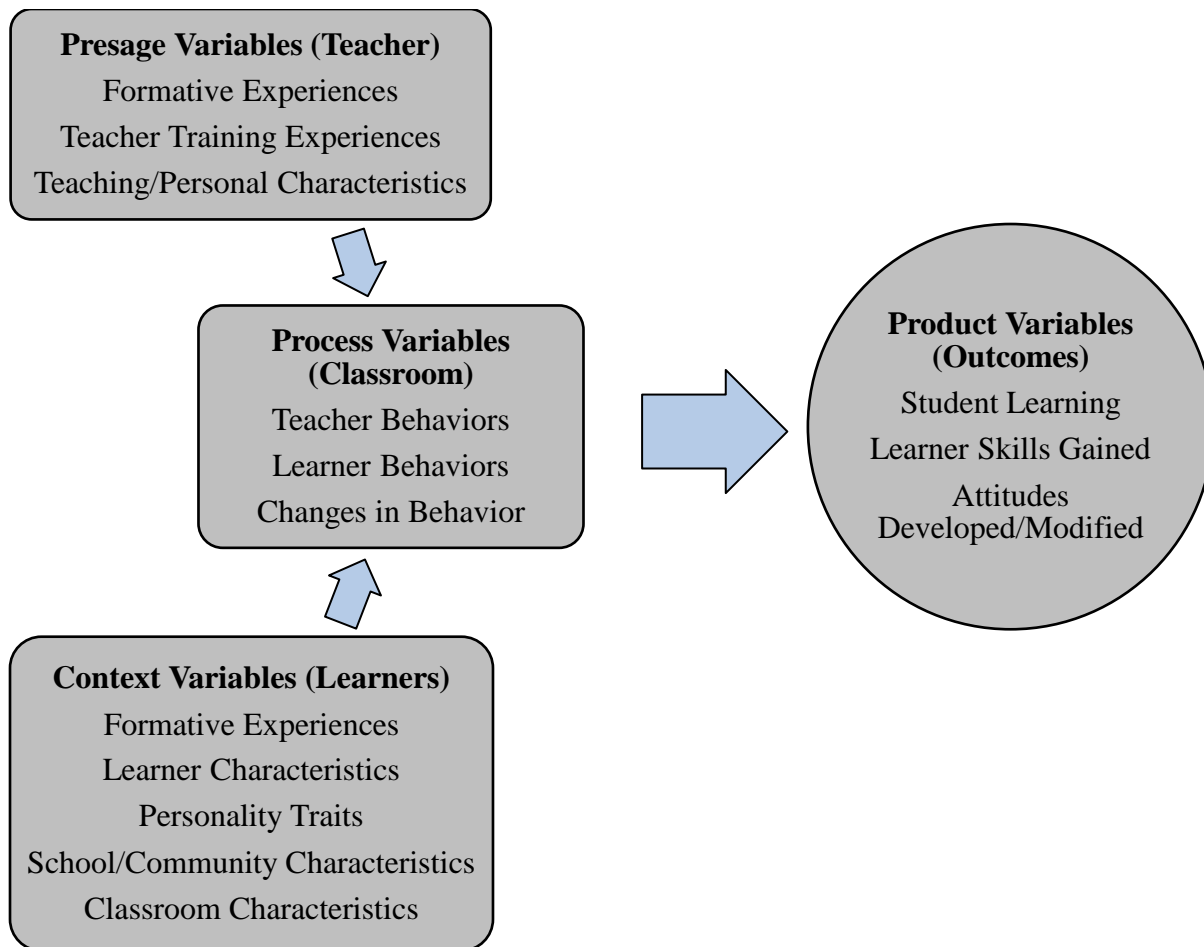
62 To help guide these academic integration endeavors, the TCTW initiative has identified a
63 set of key practices that they deemed to contribute to the improvement of student preparedness
64 for college and future career success. According to TCTW, these key practices include:

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

67 **Program of Study:** Require each student to complete a plan of study leading them to
68 complete a true concentration in an approved sequence of at least four career-technical
69 (CT) courses and an upgraded academic core leading to preparation for post-secondary

70 studies and a career. **Academic Studies:** Teach more students the essential concepts of
71 the college-preparatory curriculum by encouraging them to apply academic content and
72 skills to real-world problems and projects within their CT studies. **CT Studies:** Provide
73 more students access to intellectually challenging CT studies in high-demand fields that
74 emphasize higher-level mathematics, science, literacy, and problem-solving skills needed
75 in the workplace and in further education. **Work-Based Learning:** Enable students and
76 their parents to choose from programs that integrate challenging high school CT studies
77 and work-based learning and are planned by educators, employers and students. **Teacher**
78 **Collaboration:** Provide cross-disciplinary teams of teachers the time and support to work
79 together to help students succeed in challenging CT and academic studies. **Students**
80 **Engagement:** Engage students in CT and academic classrooms in rigorous and
81 challenging assignments using research-based strategies and technology. **Guidance:**
82 Involve students and their parents in a guidance and advisement system that develops
83 positive relationships and ensures completion of a CT concentration with an approved
84 sequence of at least four courses and an accelerated program of study. **Extra Help:**
85 Provide a structured system of extra help to assist students in completing accelerated
86 programs of study with high-level academic and technical content. **Culture of**
87 **Continuous Improvement:** Use student assessment, program evaluation data,
88 technology center performance reports, program enrollment, retention and placement
89 reports, college remediation reports, student follow-up reports and advisory committee
90 input to continuously improve school culture, organization, management, curriculum and
91 instruction to advance student learning. (SREB, 2014)

92



111

112 Figure 1. A Model for Classroom Teaching (Biddle & Dunkin, 1974, p.38).

113 Presage variables center on teacher characteristics. These teacher variables consist of
 114 formative experiences, teacher training experiences (pre-service and in-service), teaching
 115 characteristics, and personal characteristics (Dunkin & Biddle, 1974).

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

120 Process variables regard occurrences in the classroom. These are the actual activities that
 121 take place in the classroom. Process variables consist of observable changes in teacher and

122 learner behaviors. Process variables involve teacher-learner interactions. Examples of
123 occurrences and behaviors in the classroom include classroom management techniques and a
124 teacher's dislike for a particular student (Dunkin & Biddle, 1974).

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

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

139 **Purpose of the Study**

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

145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167

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)

- 168 2. Describe how to properly prepare learners to improve achievement through
169 curriculum integration (context variables).
- 170 3. Describe how to properly integrate core academic concepts into CTE curriculum
171 for maximum student achievement (process variables).

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

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

189 There were 13 CTE administrators and 63 teachers that participated in the award-winning
190 group, along with 66 CTE administrators and 69 teachers that participated in the comparison

191 group (non-awardwinning). The participants were asked to rate various factors on a four-point
192 Likert-type scale with 1= strongly disagree, 2 = disagree, 3 = agree, and 4 = strongly agree on
193 most questions. This scale was be used to determine each participant’s level of agreement on
194 each statement in the three categories. The Likert scale was developed to assess people’s
195 attitudes toward a certain subject (Leedy & Ormrod, 2005).

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

199 Dillman’s Tailored Design Method (Dillman, 2007) was utilized to solicit responses and
200 to maximize responses. The researcher used concepts from Dillman’s Tailored Design Method
201 54 (Dillman, 2007) to solicit responses. The prescribed steps in this model included a pre-notice
202 email one week prior to the email containing the questionnaire link, a second email containing an
203 informative letter and the link to the questionnaire, a follow-up reminder and thank you email,
204 and four weeks later, a repetitive informative letter and link email to reach non-respondents, and
205 a last notice email sent eight weeks after the initial email.

206 **Subject Selection**

207 For the award-winning group, the population for this study was award-winning schools
208 (Platinum High Achievement Award, Gold Readiness Award, Gold Improvement Award, and
209 the 15 most improved CTCs) that are a part of the TCTW consortium, a forum of the SREB.

210 Award winning status was based on student achievement data from the success on the
211 HSTW Assessment and responses from teacher surveys. Seniors at these schools are tested
212 toward the end of the spring semester on even-numbered years (2008, 2010, 2012, etc.). The
213 HSTW Assessment consists of three separately-timed sections which include a reading test, a

214 mathematics test, and a science test. Subjects were solicited to participate in the research study as
215 representatives from award-winning schools as well as non-award winning schools who served
216 as a comparison group. There were 18 schools that were identified as award-winning schools and
217 148 schools in the comparison group. The electronic survey instrument was sent to
218 administrators in each of the schools along with instructions to forward the instrument to
219 teachers in their school.

220 **Data Collection**

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

226 From the 166 TCTW schools that received emailed survey links in the study, a total of
227 211 surveys were received. This total is higher than the total of schools participating because the
228 initial recipients were asked to forward the link to others involved in academic and career and
229 technical integration in their school. A total of 135 surveys were received from participants at
230 schools that were classified as non-award-winning and 76 surveys were received from
231 participants at award-winning schools. Representatives from 13 out of 18 award-winning schools
232 participated in the study for a 72 percent response rate. Representatives from 66 out of the 148
233 comparison schools provided data for the comparison.

234 **Data Analysis**

235 The data were examined to determine the mean scores of both the award-winning and the
236 non-award-winning administrators. By using a four-point Likert scale with 1 = strongly disagree,

237 2 = disagree, 3 = agree, and 4 = strongly agree, the researcher was able to rate each group's
238 perceptions on how well integration variables are implemented at their schools. The means for
239 each of the variables were compared between the groups via t-tests with Eta Squared used as a
240 statistic that measures the proportion of variance associated with the individual effects to
241 determine effect magnitude.

242 Findings

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

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

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

258

259

260 **Table 1. Summary of Constructs**

	Award- Winning Participants	Non-Award- Winning Participants	F	Sig.	Eta. Squared
Presage	3.27	2.98	4.22	.044	.055
Mean (SD)	(.30)	(.44)			
Process	3.35	3.13	4.34	.041	.058
Mean (SD)	(.33)	(.33)			
Context	3.48	3.14	12.28	.001	.149
Mean (SD)	(.27)	(.31)			

261

262 **Presage Variables**

263 Table two shows the perceptions of participants and reports the mean differences of
 264 award-winning and non-award-winning groups. Concerning presage variables, the perceptions
 265 were arranged with the differences between the means from greatest to least. The table shows
 266 that participants at award-winning TCTW schools felt that the teachers at their CTE schools were
 267 continually learning and seeking new ideas on how to improve instruction at a mean of 0.65

268 higher than the participants at non-award-winning schools. Participants at award-winning TCTW
 269 schools also believed that there was an intensive emphasis on continuous improvement at their
 270 CTC and the teachers at their CTE school used data continuously to evaluate their program's
 271 curriculum, instruction, and student success. Each of these questions had a mean of 0.43 higher
 272 than the comparison participants' collective response. Participants at award-winning TCTW
 273 schools felt that Teachers and the CTE Administrator at their schools work as a team to improve
 274 student achievement at a 0.41 higher mean than participants at non-award-winning schools.
 275 Participants at award-winning schools also expressed that the teachers have had sufficient
 276 professional development to integrate academics into their CTE program at a rate of 2.27
 277 compared to the 1.95 rate of their counterparts. This resulted in a 0.32 difference. The two group
 278 z test was used to compare the groups since the standard deviation for each group was known
 279 (Ross & Shannon, 2008)

280

281 **Table 2** Presage Variables

	Award		Non-		Difference	
	Winning		Award		Between	
			Winning		Groups	
Individual Variables	Mean	SD	Mean	SD	Mean	Z
Teachers at my CTE school are	2.73	.47	2.08	.55	.65	1.18

continually learning and
 seeking new ideas on how to
 improve instruction

There is an intensive emphasis on continuous improvement at my CTE school	2.82	.40	2.39	.56	.43	.77
Teachers at my CTE school use data continuously to evaluate their program's curriculum, instruction, and student success	2.27	.65	1.84	.79	.43	.54
Teachers at my CTE school have had sufficient professional development to integrate academics into their CTE program	2.27	.65	1.95	.74	.32	.43
Teachers at my CTE school often spend evenings and/or weekends working with their students	1.73	.90	1.42	.79	.31	.39
Teachers at my CTE school maintain a demanding yet supportive environment that pushes students to do their best	2.55	.52	2.26	.57	.26	.51
CTE teachers and academic teachers are given mutual	.65	1.61	.90	1.35	.25	-.19

planning time for collaboration throughout the school year	Teachers at my CTE school	1.64	.81	1.46	.79	.18	.23
often attend students extracurricular activities	Teachers at my CTE school are	2.27	.47	2.15	.62	.12	.19
active listeners to their students' concerns	I provide periodic feedback to my teachers to help instruction at my CTE school	2.55	.52	2.45	.53	.10	.19
CTE teachers and academic teachers work well together	CTE teachers and academic	2.25	1.73	.69	2.15	.10	.73

282

283 **Process Variables**

284 Table three displays the results of the perceptions of participants concerning process
285 variables and reports the mean differences of award-winning and non-award-winning groups
286 from greatest to least. Table three indicates that participants at award-winning TCTW schools
287 estimate the participation of their students earning post-secondary college credit (dual
288 enrollment) was far above what those at non-award-winning schools estimated in their schools.
289 In fact, there was a 2.32 difference in the means of these responses. This difference was by far
290 the largest difference in the entire data set. Comparison group participants reported that the
291 teachers at their schools gave homework at a higher mean rate of 1.66 than award-winning

292 schools, which had a 1.00 mean. Participants at award-winning schools also estimated that there
 293 was a much higher number of students earning employability credentials indicated by a mean
 294 difference of 0.53 when compared to the estimates reported at the non-award-winning schools.
 295 Table three also expressed a difference in the perceptions of participants at award-winning
 296 schools on their students being given multiple opportunities to learn content at a mean rate of
 297 0.39 higher than those at the non-award-winning schools. Award winning schools provided their
 298 students with intellectually demanding studies that emphasized science at a mean rate 0.33
 299 higher than non-award-winning schools.

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

306

307 **Table 3**

308 Teaching and Learning Characteristics, Process Variables

	Award- Winning		Non-Award- Winning		Difference Between Groups	Difference Between Groups
Individual Variables	Mean	SD	Mean	SD	Mean	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.	1.00	1.04	1.66	1.06	.66	-.62
Students at my CTE school earn employability credentials each year	4.55	1.92	4.02	1.69	.53	.31
Students at my CTE school are given multiple opportunities to learn content	2.73	.47	2.34	.54	.39	.72
Students at my CTE school are provided with intellectually demanding studies that emphasize science	2.18	.40	1.85	.66	.33	.50
Students at my CTE school are commonly allowed to develop their own assignments	2.27	.47	2.00	.52	.27	.52
Teachers at my CTE school place great emphasis on the use of technology	2.55	.52	2.30	.59	.25	.42

Students at my CTE school are provided with intellectually demanding studies that emphasizes math	2.27	.47	2.03	.56	.24	43
Teachers at my CTE school give extra help to students outside of class time	1.55	1.21	1.77	1.70	.22	-.13
CTE Student Organizations (FBLA, FFA, HOSA, SkillsUSA, TSA, etc.) activities are strongly emphasized at my CTE school	2.73	.65	2.60	.59	.13	.22
Students at my CTE school are provided with intellectually demanding studies that emphasizes literacy	2.27	.65	2.15	.54	.12	.22
A strong emphasis is placed on these teaching and learning methods at my CTE school.						
Student Presentations	2.55	.52	2.02	.62	.53	.85
Student Research	2.18	.60	1.78	.63	.40	.62

Discussions	2.45	.69	2.25	.60	.20	.33
Lecture	1.64	.67	1.85	.75	.21	-.28
Students Sharing in Small Groups	2.36	.50	2.18	.65	.18	.28
Group Projects	2.45	.52	2.31	.62	.14	.23
Students Viewing Videos	1.80	.79	1.72	.55	.08	.15
Teacher Demonstrations	2.45	.69	2.51	.50	.06	-.12
Teacher Presentations	2.27	.65	2.26	.51	.01	.02

309

310 **Context Variables**

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

321 succeed at the CTC at a mean rate of 0.40 higher at the award-winning-schools when compared
 322 to the other group.

323

324 **Table 4.** Context Variables

325

	Award Winning		Non-Award Winning		Difference Between Group Means	Difference Between Groups
Individual Variables	Mean	SD	Mean	SD		Z
Most students have completed a career exploration course in the past.	4.05	1.55	3.05	1.70	1.00	.59
A substantial number of students at my CTE school receive free or reduced lunch.	2.45	.93	3.17	1.08	.72	-.67
The goals and priorities at my CTE school are clearly communicated.	2.82	.40	2.36	.55	.46	.84
Students have the math skills to succeed at my school.	2.00	.45	1.60	.49	.40	.82
The feeder school(s) for my CTE school set high expectations for their students.	2.18	.75	1.81	.63	.37	.59

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

327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349

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

350 maintain a demanding yet supportive environment that pushes students to do their best. Again,
351 participants at award-winning TCTW schools exhibited better mean scores, than the other
352 participants' group. A 2.25 mean was recorded for the award-winning participants' perception
353 and a 2.15 for the non-award-winning group for the statement, CTE teachers and academic
354 teachers work well together. Award-winning schools were 0.10 better in regards to the mean.
355 Principals at award-winning TCTW schools had an average of 2.27 on the statement, teachers at
356 my CTE school are active listeners to their students' concerns, while the non-award winning
357 group had a mean of 2.15. This exhibited a 0.12 difference in favor of the award-winning
358 schools.

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

368 When teaching and learning or process variables were analyzed, it was determined that
369 participants at award-winning TCTW schools estimated their students were earning post-
370 secondary college credit (dual enrollment) at a rate far above what participants at non-award-
371 winning schools estimated at their schools. Participants at award-winning schools also estimated
372 that there was a much higher number of their students earning employability credentials when

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

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

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

392 **Discussion and Implications**

393 This study proved to be consistent with much of the previously published body of
394 literature concerning the integration of academics in to the context of CTE. The results do imply
395 that previous researchers and practitioners (Bottoms et. al, 2004; Hyslop, 2007; Stone et. al,

396 2006) were correct in their assumptions that an integrated CTE curriculum leads to higher
397 student achievement. Findings in this study were consistent with the stance taken by Hyslop
398 (2007), “Integration of academic competencies into career and technical education curricula and
399 of real-world content and applied methods and examples into traditional classes can raise
400 achievement levels and increasing understanding of rigorous content” (p. 40). Responses from
401 award-winning participants and teachers indicate that schools that are doing a better job of
402 integrating academics into the CTE curriculum are producing students that are outperforming
403 others on the HSTW Assessment.

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

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

417

418

419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441

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.

442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463

References

Bottoms, G., Presson, A., & Han, L. (2004, May). *Linking career/technical studies to broader high school reform* (Research Brief). Retrieved from www.sreb.org/programs/hstw/publications/broiefs/04V09_ResearchBrief_CT_studies.

Dillman, D. A. (2007). *Mail and internet surveys: The tailored design method* (Vol. 2). Hoboken, NJ: Wiley.

Dunkin, M., & Biddle, B. (1974). *The study of teaching*. New York: Holt, Rinehart & Winston.

Gordon, H. R. D. (2008). *The history and growth of vocational education in America*. (3rd ed.) Long Grove, IL: Waveland.

Grubb, N., Davis, G., Lum, J., Plihal, J., & Morgaine, C. (1991). *The cunning hand, the cultured mind: Models for integrating vocational and academic education*. Berkley, CA: National Center for Research in Vocational Education, University of California at Berkley.

Hyslop, A. (2007). Dramatically improve how and where academics is taught. *Techniques*, 82(1), 40-43 Retrieved November 2, 2010 from Pro-quest database.

Leedy, P., & Ormrod, J. (2005). *Practical Research: Planning and Design*. River, N.J.: Pearson Education, Inc.

464 McIlvaine, A. R. (2015, August 19). *Reconsidering career planning*. Retrieved from
465 <http://www.hreonline.com/HRE/print.jhtml?id=534359176>

466 Ross, M., & Shannon, D. (2008). *Handbook on applied quantitative methods in education*.
467 Dubuque, IA: Kendall Hunt.

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

471 Southern Regional Education Board. (2014). *Technology centers that work*. Retrieved from
472 http://www.sreb.org/page/1084/technology_centers_that_work.html

473 Stone, J.R. III., Alfeld, C., Pearson, D. Lewis, M.V., & Jenson, S. (2006). *Building academic*
474 *skills in context: Testing the value of enhanced math learning in CTE*. St. Paul, MN:
475 National Research Center for Career and Technical Education. Retrieved from
476 <http://136.165.122.102/UserFiles/Math-in-CTE/MathLearningFinalStudy.pdf>.

477 The Conference Board (2006). Most young people entering the U.S. workforce lack critical
478 skills essential for success. Retrieved from
479 http://www.p21.org/index.php?option=com_content&task=view&id=250.

480

481