TRACING STUDENT PERFORMANCE IN CAREER AND PROFESSIONAL EDUCATION

Technology Coursework Related to Better Attendance, Higher GPAs in Florida

Five years ago, the state of Florida challenged the business community, K–12 school districts and postsecondary institutions to work together to strengthen student pathways to college and careers. By one measure—performance of high school students who take technology courses that lead to industry certification—preliminary results indicate that Florida is on the right track for achieving that goal.

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INTRODUCTION

Like many states, Florida has taken action over the past decade to transform industrial-era "vocational education" into more robust career and technical education (CTE), which integrates academic, employability and technical skills that are in demand in today's global marketplace.

In Florida, the Career and Professional Education (CAPE) Act of 2007 aimed to "attract, expand, and retain targeted, high-value industry and to sustain a strong, knowledge-based economy." The objectives of the CAPE Act are as follows:

1. To improve middle and high school academic performance by providing rigorous and relevant curriculum opportunities;
2. To provide rigorous and relevant career-themed courses that articulate to postsecondary-level coursework and lead to industry certification;
3. To support local and regional economic development;
4. To respond to Florida's critical workforce needs; and
5. To provide state residents with access to high-wage and high-demand careers.

A key component of the CAPE Act is state-approved industry certifications that are critical to Florida employers. The legislation requires districts to provide academically rigorous courses that meet or exceed state-adopted, subject-area standards; lead to industry certification; and, where appropriate, result in postsecondary credit. The legislation also required districts to set up career and professional academies to offer this coursework, and to ensure standards-based instruction by industry-certified faculty.

This report offers a first glimpse at metrics for high school students who took at least one technology course that leads to industry certification in the baseline 2007–08 school year, when the legislation went into effect, and in the 2008–09 school year, when Florida's 67 school districts began ramping up delivery of these and other CTE courses. The findings are preliminary, but promising, in terms of student engagement, performance and preparation for college and careers:

High school students who took at least one technology course, and at least one industry certification exam, had better attendance and higher grade point averages (GPAs) compared to students of similar demographics who took no technology courses or exams in this same period.

Moreover, students who took at least one technology course, and at least one industry certification exam, earned admission to four-year colleges and universities at virtually the same rate as students who took no technology courses or industry certification exams. This seems to indicate that students who took technology courses and exams had the same opportunity to enter postsecondary institutions as other students.

The positive relationship between technology coursework and student outcomes is correlational, not necessarily causal. However, given that attendance, GPA and admission to four-year colleges and universities are important measures of high school success—and strong, research-based predictors of postsecondary success—this relationship warrants attention and further exploration.

Florida's efforts to strengthen CTE mirrors a national movement in this direction, which was underscored in the 2006 reauthorization of the federal Carl D. Perkins Career and Technical Education Improvement Act. Hence, the findings may be relevant to a renewed emphasis on CTE that is under way now in many other states.

Industry Certification in Florida

The findings in this report are based on student data from the Florida Department of Education pertaining to technology courses that lead to industry certifications from 10 industry providers:

1. Adobe Systems
2. Apple Computer, Inc.
3. A*S*K Institute—Institute for Assessment
4. Cisco Systems, Inc.
5. Computing Technology Industry Association
6. Federal Aviation Administration
7. Florida Department of Children and Families
8. Microsoft Corporation
9. Oracle Corporation
10. Prosoft Learning

Students typically must complete at least 150 hours of instruction in a one-year class with an industry-provided curriculum to be eligible to take a certification exam. Students must pass the exam to earn certification. Some industry providers offer multiple technology courses—or sequences of courses of increasing difficulty—that prepare students to earn multiple certificates.

Florida has articulation agreements with postsecondary institutions, which provide students with college credit for some industry certifications and "establish educational pathways to promote student movement up the college and career ladder" (Florida Department of Education, Office of Articulation, 2011). A planned sequence of academic and CTE coursework, known as a program of study, can help students attain industry-recognized certifications and transition successfully to postsecondary education.

In Florida and other states, technology coursework is aligned to one or more of 16 nationally recognized career clusters—such as Arts, A/V Technology & Communications, Information Technology, and Business Management & Administration—and to some of 79 related career pathways.

KEY FINDINGS

Students who completed at least one technology course, and took at least one industry certification exam, had significantly higher attendance rates than comparable students. Florida students who took at least one technology course attended significantly more days of school—165.2 days, on average, in the 180-day school year—than students of comparable demographics (statistically controlled for race/ethnicity, language, disability status, gender and GPA). On average, the comparison group of students who took no technology courses or exams attended 148.5 days of school, as shown in Figure 1.

That amounts to an average of almost 17 more days—or more than three more weeks—in school for students who took technology classes.

Simply attending more days of high school is positively related to high school GPA (e.g., Steward, Steward, Blair, Jo & Hill, 2008) and standardized test scores (e.g., Roby, 2004).

In addition, there was less variability in attendance rates for the students who took technology classes and industry certification exams. In other words, the attendance rates of these students were more similar (rates clustered closer to the average), compared to their peers, whose attendance rates varied widely from the average. (The distribution of individual student attendance data in the average rates of attendance is expressed in the standard deviations in Figure 1. For students who took technology classes, the standard deviation was 29.1. For students who did not take technology classes, the standard deviation was 49.0.)

Moreover, a closer look at the relationship between attendance and technology coursework offered by one industry certification provider—the only one examined at this level of detail—indicated an even stronger positive relationship. Students who took more than one course offered by this provider had significantly higher attendance rates (169.27 days in school, on average) than both students who took just one of these courses and students who took no technology courses. This could suggest that there is a cumulative effect on attendance as students advance in technology coursework, a longitudinal relationship that requires more data to fully examine.

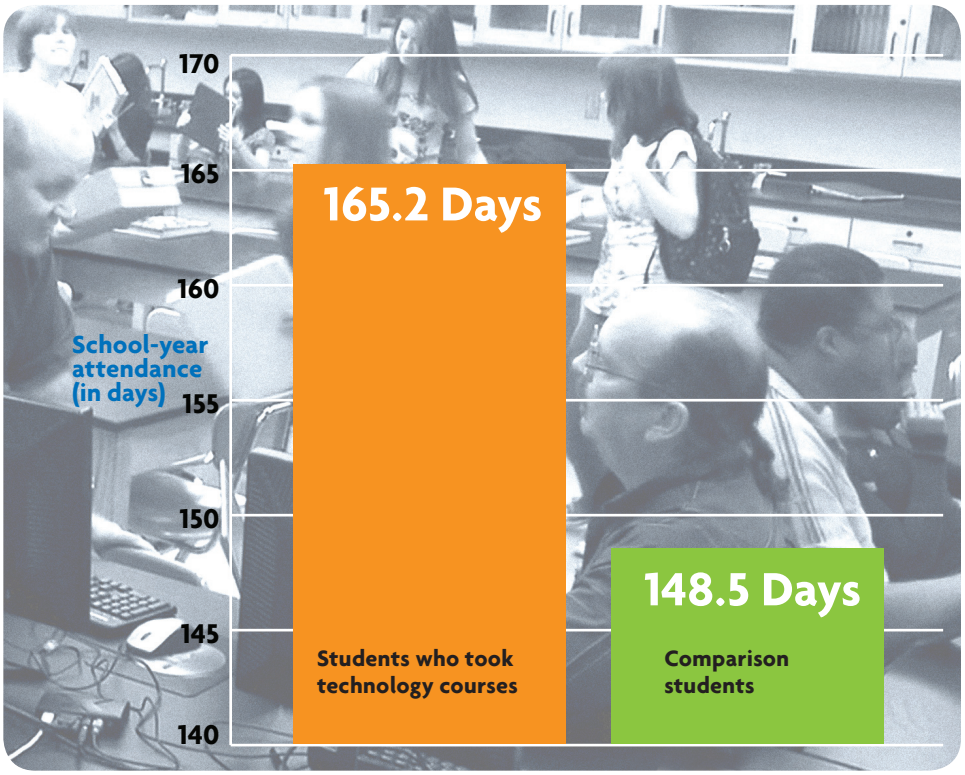
The relationship between technology coursework and attendance is correlational, not causal. Many factors, including student health, motivation and interest, and family and peer support, contribute to attendance.

Controlling for the demographic variables, technology coursework accounted for 11 percent of the variance between the attendance rates of students who took technology courses and those who did not.

Attendance is one way that schools gauge student engagement in learning—and increased attendance can be seen as a necessary (but not sufficient) condition for improved GPA. Furthermore, attendance is of critical importance to school districts whose state funding may be dependent on average daily attendance. Additional revenue from increased attendance could be used to cover the costs of technology, teachers and industry certification programs. These early findings from Florida suggest an opportunity for further study about the relationship between technology coursework and attendance.

Figure 1.

HIGHER ATTENDANCE—AND LESS VARIABILITY IN ATTENDANCE—FOR STUDENTS WHO TOOK A TECHNOLOGY COURSE



Note:
Significant difference in attendance between students who took at least one technology course and the comparison group, $F(1, 3457) = 39.20$, $p<0.01$.

Source: Grunwald Associates LLC based on data from the Florida Department of Education

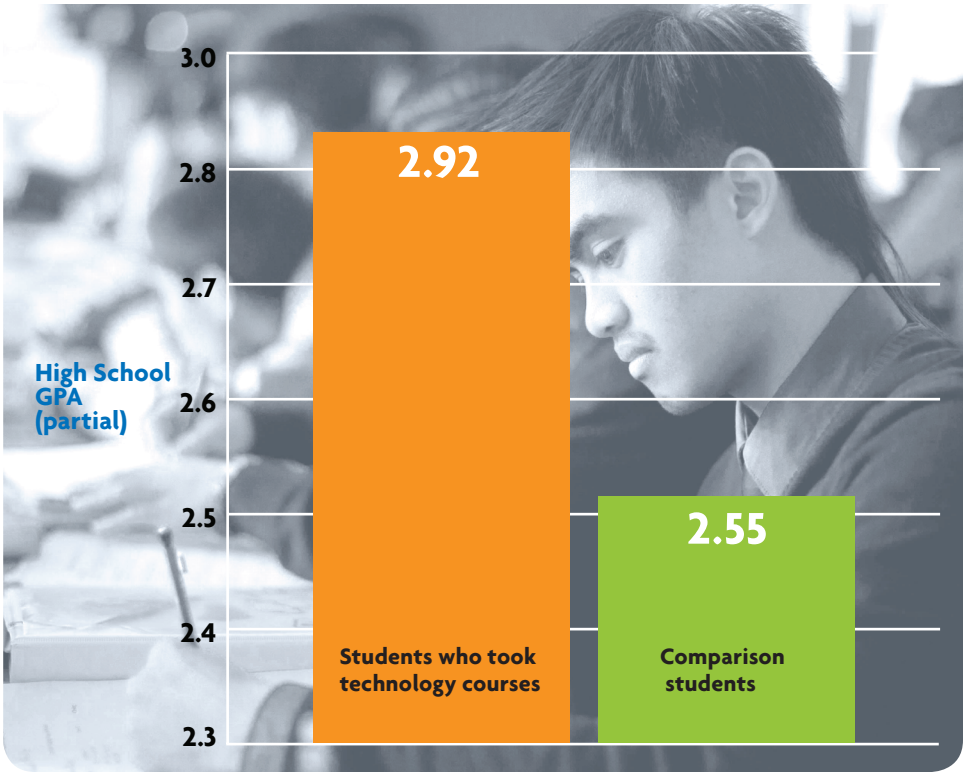
Students who completed at least one technology course, and took at least one industry certification exam, had significantly higher GPAs than comparable students. Florida high school students who took at least one technology course had an average GPA of 2.92, compared to an average GPA of 2.55 for students of similar demographics (statistically controlled for race/ethnicity, language, disability status, gender and attendance) who took no technology classes, as shown in Figure 2.

An important note about GPAs: The higher GPAs for students who took technology classes represent grades in their *other* classes. That's because, in Florida schools, technology courses that lead to industry certification are graded as pass/fail classes. That is, they appear on student records and students receive high school credit for them, but they are not calculated as letter grades in GPAs. This finding counters any notion that the GPAs of students who took technology classes were inflated by the inclusion of grades in courses that some still perceive as "easy" or less academically challenging than courses in other subjects.

As with attendance, a closer look at the relationship between GPA and technology coursework offered by one industry certification provider—the only one examined at this level of detail—indicated an even stronger positive relationship. Students who took more than one course offered by this provider had significantly higher GPAs than both students who took just one of these courses and students who took no technology courses. The GPAs of students who took more than one course from this provider averaged 2.98 (compared to 2.76 for students who took just one technology

Figure 2.

HIGHER GRADE POINT AVERAGES FOR STUDENTS WHO TOOK TECHNOLOGY CLASSES



Notes:
Most students who took technology courses had not reached graduation by the 2008–09 school year, the year for which GPA data was available. Thus, a partial GPA (including grades earned, number of credits attempted and cumulative grade point average) was created.

Significant difference in high school GPA between students who took technology courses and the comparison group, $F(1, 3457) = 189.04$, $p<0.01$.

Source: Grunwald Associates LLC based on data from the Florida Department of Education

course from this provider and 2.55 for students who took no technology courses). This could suggest that there is a cumulative effect on GPAs as students advance in technology coursework, a longitudinal relationship that requires more data to fully examine.

The relationship between technology coursework and GPAs is correlational, not causal. As with attendance, many factors contribute to high school GPAs, including student motivation, effort, interest, course rigor, instruction, access to learning resources, and school and family expectations. It is possible that students who self-selected into technology courses already had higher GPAs, stronger contributing factors, or both, than students of comparable demographics who did not take these courses.

On the other hand, it is equally possible that taking technology courses helped to improve students' GPAs in other classes. It could be that something about those technology courses—the curriculum, instruction or learning methods, for example—contributed to their higher GPAs, or other factors that affect GPAs, including, potentially, attendance.

Controlling for demographic variables (race/ethnicity, language, disability status, gender and attendance), technology coursework accounted for 22 percent of the variance between the average GPAs of the technology course-takers and their comparable peers—an even higher percentage than the variance between the two groups for attendance.

Further research that examines student GPAs and other performance data beginning in middle school, or earlier, is needed to better understand the impact of technology coursework on grades.

The rates of admission into four-year colleges and universities of students who completed at least one technology course, and took at least one industry certification exam, and students who did not were essentially the same. Among Florida high school students in both groups who applied to four-year postsecondary institutions, there was no statistical difference in their acceptance rates, as shown in Figure 3.

These early findings could help to dispel lingering perceptions that students who take CTE courses are less likely to go to four-year colleges and universities than other students, that these courses do not prepare students for college and that these courses are less rigorous than other courses. While it's not yet possible to know whether technology coursework gives students an edge in postsecondary admission, the early findings suggest that it does not hold them back.

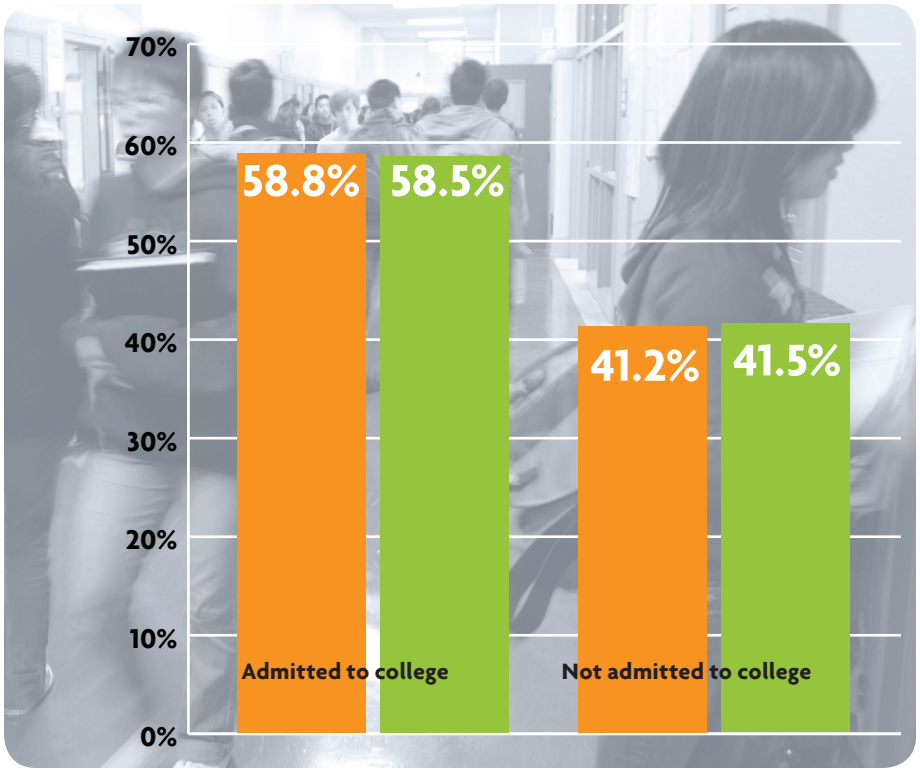
High school GPA is consistently found to be a strong predictor of retention and GPA in higher education (e.g., Mattson, 2007; Ting & Robinson, 1998; Wolfe & Johnson, 1995).

In a related finding—although the difference was not statistically significant—students who took at least one technology course and opted to enroll in community college seemed more likely than other students of similar demographics to enroll full-time (rather than part-time).

There are many reasons why students might choose to enroll full-time or part-time in community college, such as the need to balance family, school and work obligations to pay college costs. Further research could determine whether students who took technology courses, earned industry certifications and, potentially, college credit—or successfully advanced along a career pathway in high school—might have a more purposeful and focused plan for their postsecondary years than other students. These could be contributing factors in full-time vs. part-time enrollment in community colleges.

Figure 3.

EQUAL RATES OF ADMISSION TO FOUR-YEAR COLLEGES AND UNIVERSITIES FOR STUDENTS WHO TOOK TECHNOLOGY COURSES AND STUDENTS WHO DIDN'T



Students who took technology courses

Comparison students

Note:
Only students who applied to a four-year college or university were included in this analysis.

Source: Grunwald Associates LLC based on data from the Florida Department of Education

The correlational relationships between technology coursework and admission rates to four-year institutions—and the potential relationship between technology coursework and enrollment status in community colleges—are based on data from a smaller segment of the population of students who took technology courses in the years studied. That's because data on postsecondary application and admission rates for students who took these classes early in their high school careers was not yet available. Likewise, because of similar limitations in data availability, it was not possible to compare the graduation rates of students who took technology courses and those who did not.

Longitudinal data is needed to further examine the relationship between technology course-taking, college admission rates and enrollment status, and high school graduation rates.

Who Takes Technology Courses?

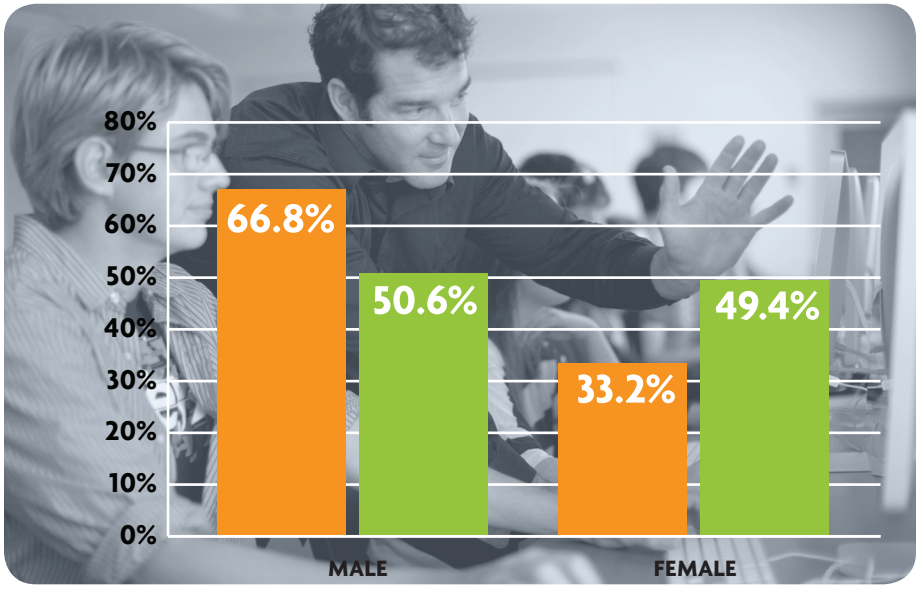
In the two years examined, Florida students who opted to take technology courses that lead to industry certification were disproportionately male, English-speaking and white compared to students who did not.

Figure 4 shows the gender breakdowns for the students who took technology coursework and their peers who did not. Figure 5 shows the primary language of each group of students. Figure 6 shows the race/ethnicity composition of each group. All of these differences are statistically significant. There was no statistical difference in the disability status between the two groups.

While it may not be surprising that boys are more interested in technology than girls, it's good news that these courses engage boys—a population that some see as disaffected in school. At the same time, districts and schools might have an opportunity to engage more girls, English language learners and minorities in technology courses, given the high demand for underrepresented populations in technology-related careers and, more generally, in science, technology, engineering and mathematics (STEM) fields.

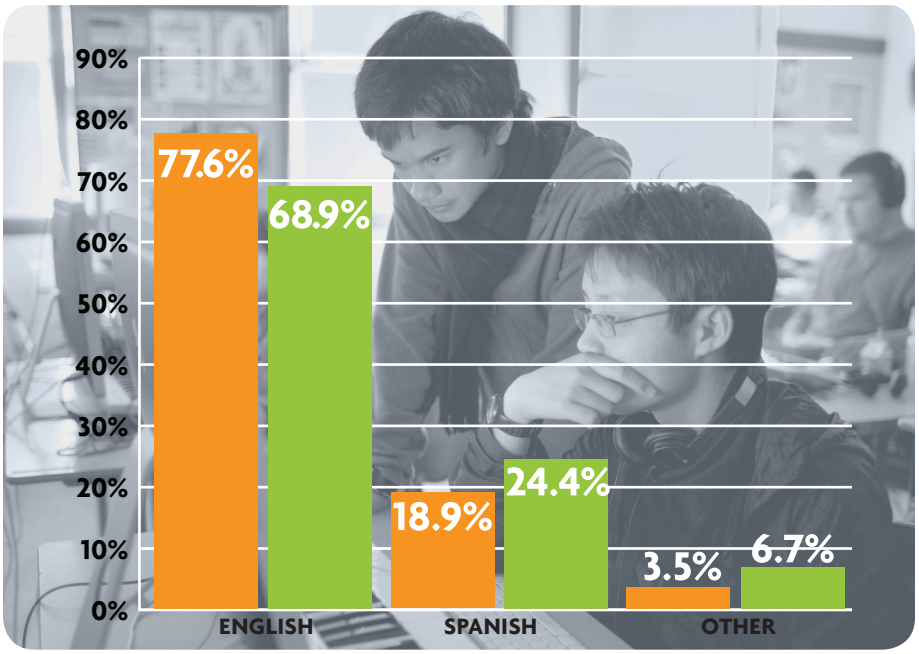
TECHNOLOGY COURSE-TAKERS ARE MOSTLY MALE, ENGLISH-SPEAKING AND WHITE

Figure 4. Enrollment by Gender



Source: Grunwald Associates LLC based on data from the Florida Department of Education

Figure 5. Enrollment by Primary Language

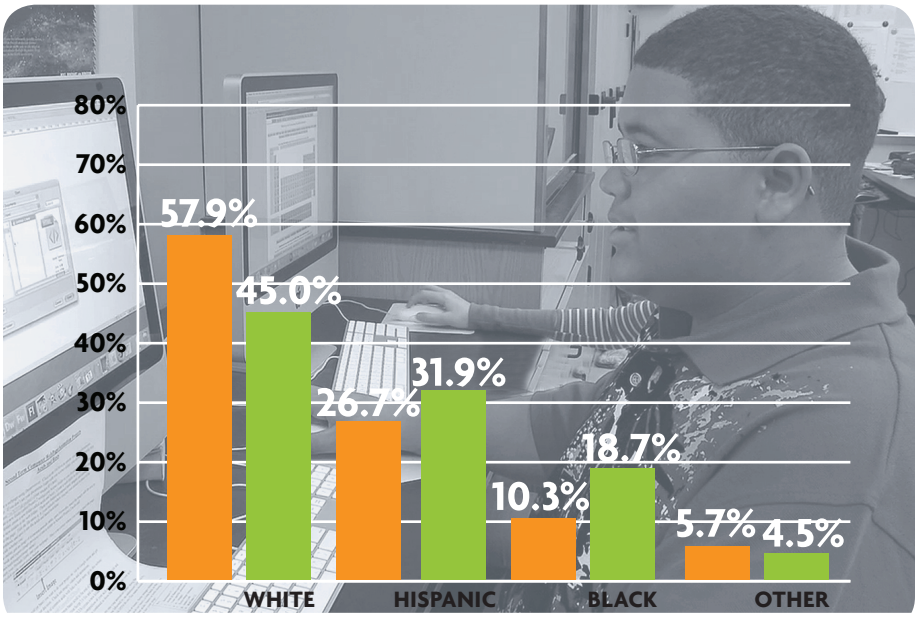


Students who took technology courses

Comparison students

Source: Grunwald Associates LLC based on data from the Florida Department of Education

Figure 6. Enrollment by Race/Ethnicity



Students who took technology courses

Comparison students

Source: Grunwald Associates LLC based on data from the Florida Department of Education

A RESEARCH AGENDA

The preliminary findings from the review of data related to Florida's CTE technology courses provide reason for cautious optimism. Over many years, research (some of which is cited earlier) consistently shows that attendance and GPA, in particular, are associated with high school and postsecondary success. Industry credentials are valued by employers and, in some cases, convey postsecondary credit. And, while admission to four-year colleges and universities is no guarantee of retention or attainment in higher education, it is clearly a positive first step.

The findings reported here were generated from student demographic data beginning in a baseline year (2007–08) and, primarily, from student performance data from a ramp-up year (2008–09). During that period, many Florida districts, schools and teachers were delivering the technology courses for the first time, or ramping up considerably in new career and professional academies. It is possible that schools might get better at providing this instruction with experience over time, which could increase any positive effects on student outcomes. The preliminary findings provide an excellent springboard for further research into the potential effects of CTE courses when schools and teachers are more practiced in delivering them.

The preliminary findings provide an excellent springboard for further research into the potential effects of CTE courses when schools and teachers are more practiced in delivering them.

To develop a more comprehensive understanding of the relationship between technology coursework and student outcomes, we offer the following starting points for additional research in Florida and in other states:

Starting Points for Additional Research

1. Analyze baseline data on student demographics, academic coursework and performance prior to high school, and more longitudinal data on student performance after they take technology courses, to draw richer inferences—especially for higher education outcomes. Additionally, track students' industry certifications earned, college credits achieved in high school, and postsecondary admission, retention and attainment.
2. Explore the trajectory of attendance and grades for students enrolled in technology courses, beginning early in high school.
3. Generate and analyze quantitative and qualitative data on students' reasons for enrolling in technology courses that lead to industry certification (e.g., student interest, perceived difficulty of courses, career preparation, industry certification, college credit, pass/fail vs. grade).
4. Examine whether out-of-school activities that promote the use of technology (e.g., technology, computing, robotics, engineering or science clubs; tech support for school performing arts productions or sporting events; online gaming and other personal technology use) impact attendance, grades and persistence in career pathways.
5. Consider whether social connections that emerge from technology coursework influence attendance, grades and persistence in career pathways.
6. Generate data on students' attitudes toward school and study the relationships of student attitudes with attendance and GPA.
7. Explore how school districts promote CTE, and how students and parents learn about technology courses that lead to industry certification.
8. Examine students' prior technology experiences and their relationship to course selection.
9. Probe students' use of technology in their other classes and its relationship to their interest in coursework that leads to industry certification.
10. Study the perceived and potential barriers to technology coursework among girls, English language learners and minorities.

An Update on Florida's Progress

While this report focuses on analysis of student data from the 2008–09 school year, the Florida Department of Education has been keeping track of student performance in career and professional academies since then.

The latest data available from the 2010–11 school year indicate that industry certifications, in particular, are associated with positive student performance, as shown in Table 1. This data include students in *all* CTE classes, not just technology-focused courses.

Students who were enrolled in academies and earned industry certifications had higher average GPAs, lower rates of chronic absenteeism and disciplinary actions, and a lower dropout rate than students who were not enrolled in academies. They also were more likely to take at least one accelerated course and, as 12th graders, earn a standard diploma.

Students who were enrolled in academies, but did not earn certifications (either because their courses did not offer certifications or because they did not pass the certification exams), performed better than non-academy students on these measures as well—but not as well as academy students who did earn industry certifications.

Table 1. **CAREER AND PROFESSIONAL ACADEMY PERFORMANCE REPORT, 2010–11**

Performance Indicator	**Non-Academy Students** (No Certification)	**Academy Students** (No Certification)	**Academy Students, Plus Certification**
Average GPA	2.46	2.58	3.0
Chronically absent	16.3%	15.7%	9.9%
At least one disciplinary action	20.6%	20.5%	10.9%
Dropout rate	2.1%	0.9%	0.3%
At least one accelerated course	22.9%	25.4%	41.2%
12th graders earning standard diploma	73.9%	85.9%	96.1%

Source: Florida Department of Education, 2011

In the 2010–11 school year, 18 percent of high school students were enrolled in academies, up from about 2 percent in 2007–08. More students are earning industry certifications.

The pass rate for students earning industry certificates dropped sharply in the 2009–10 school year. That year, Florida factored student certification attempts into its formula for high school performance grades—and thus gave schools an incentive to encourage more students to take certification exams. The pass rate recovered considerably in 2010–11, even as more students attempted the exams.

Table 2. **FOUR-YEAR TRENDS IN CAREER AND PROFESSIONAL ACADEMIES**

	2007–08	2008–09	2009–10	2010–11
Number of students enrolled in academies	19,868	53,325	102,430	154,327
Percentage of high school population	2.2%	6.5%	12%	18%
Students earning industry certifications	803	1,855	8,629	20,644
Certification pass rate	85.7%	80.4%	59.6%	73.6%

Source: Florida Department of Education, 2011

Table 3 shows the number of registered career and professional academies by career cluster. The Information Technology, Arts/AV Technology & Communications, Business Management & Administration, and Science, Technology, Engineering & Mathematics career clusters are among those that feature technology coursework.

Table 3. **REGISTERED CAREER AND PROFESSIONAL ACADEMIES BY CAREER CLUSTER, 2010–11**

Primary Career Cluster	Number of Academies
Information Technology	218
Health Sciences	180
Hospitality & Tourism	161
Arts, A/V Technology & Communications	126
Business Management & Administration	106
Architecture & Construction	102
Science, Technology, Engineering & Mathematics	95
Agriculture, Food & Natural Resources	82
Transportation, Distribution & Logistics	67
Education & Training	56
Marketing, Sales & Service	53
Finance	29
Law, Public Safety & Security	11
Manufacturing	8
Human Services	2
Other	2

Source: Florida Department of Education, 2011

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About the Study

Brianna Scott, Ph.D., Assistant Professor of Psychology at the University of Indianapolis School of Psychological Sciences and adjunct staff member at Rockman et al, conducted the analysis on which this report is based.

In response to our request, the Florida Department of Education provided anonymous student data from the 2007–08 and 2008-09 school years. From this data, two groups of students were analyzed:

- All high students who had attempted technology coursework and industry certification exams related to this coursework at any point in these two school years. Due to the small sample size for the 2007–08 school year (n = 152), all analyses focused on the 2008–09 sample population (n = 1,552), with the exception of descriptive statistics (e.g., race/ethnicity, language, disability status, gender).

- A random sample of all high school students in the same grades and the same schools as the first group, but who had not enrolled in any technology courses or taken any industry certification exams related to this coursework in these two school years. Because this comparison group for 2008–09 was extremely large (n = 199,475), a random sample of approximately 1 percent of this population (n = 1,911) was selected as the comparison group, to keep the sample sizes for each group similar.

For the analysis of admission rates to four-year colleges and universities, and enrollment status in community colleges, smaller subsets of these two groups comprised the sample populations. Students between the ages of 17 and 21 who had the opportunity to graduate (and thus apply to or enroll in college) were included in these two groups. The sample sizes for this analysis for the students who took technology courses and exams, and those who did not, were 872 and 704, respectively.

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