



NTACT

National Technical Assistance Center on Transition

Career and Technical Education and Academics Annotated Bibliography

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What is Career and Technical Education and Academics?

Career and Technical Education (CTE) has predominantly existed parallel to academic education. Recently however, CTE and academic instruction have begun to intersect and merge. This confluence can be very beneficial for students with disabilities. Due to the Individuals with Disabilities Education Act (IDEA, 2004) and the Carl D Perkins Act (2018), students with disabilities are required to receive a free and appropriate public education which can, and should, include CTE instruction. Due to the current structure of career based clusters in CTE instruction, academics can more easily be applied to the skills and concepts that students are learning in CTE-based classes.

Carl D. Perkins Vocational and Applied Technology Education Act, 20 U.S.C. §2301 (2018).

Individuals with Disabilities Education Act, 20 U.S.C. § 1400 (2004).

Why is Career and Technical Education and Academics in Transition Planning Important?

Careful planning for both academic and CTE instruction is critical. It allows for students with disabilities to access the general education curriculum similarly to their nondisabled peers. Typically, peers in the general education receive both academic and CTE instruction. Due to the current structure of CTE instruction in the form of career based clusters, there has been some movement toward CTE-focused academic instruction through curriculum integration. This can be especially helpful for students with disabilities, as they can receive both academics and CTE instruction in one class.

Carl D. Perkins Vocational and Applied Technology Education Act, 20 U.S.C. §2301 (2018).

Individuals with Disabilities Education Act, 20 U.S.C. § 1400 (2004).

What Does the Literature Say About Career and Technical Education and Academics in Transition Planning?

Studies have shown that curriculum integration and academic CTE classes have a positive impact on test scores, technical skills, academic skills, and even dropout rates for students with and without disabilities. The following is a discussion of the literature addressing the ways curriculum integration and CTE programs with an academic focus impact students with disabilities. The target populations of these studies have included students with disabilities, students without disabilities, students in CTE classes, students not in CTE classes, as well as teachers.

Bae, S. H., Gray, K., & Yeager, G. (2007). Retrospective cohort comparison of career technical education participants and non-participants on state mandated proficiency tests. *Career and Technical Education Research*, 32, 9-22.

- Examined the differences between CTE students' performance on state-mandated 11th grade math and reading proficiency tests and a comparison group of non-CTE students with previously similar math test scores. It also examined whether student performance on 11th grade state-mandated proficiency test was associated with math course-taking patterns prior to CTE enrollment.
- Results indicated that there was no difference in math test scores between CTE and non-CTE students of similar past achievement records. They also indicated that mixed results were found for students' performance on the math and reading tests.
- Recommendations included repeating the study with assurance that CTE and non-CTE students would be receiving the same math and reading instruction.
- Implications for practice include not neglecting academic skills and classes for students in CTE.

Bisconer, S. W. (1993). A psychometric evaluation of curriculum-based vocational assessment rating instruments used with students in mainstream vocational courses. *Career Development for Exceptional Individuals*, 16(1), 19-26.

- Examined the results of the curriculum-based vocational assessment (CBVA) on students with disabilities who were educated in an overseas military based school, specifically in regards to work-related behavior and generalized instructional outcomes.
- Results indicated that with the exception of a few items, work-related behaviors and generalized instructional outcomes from the CBVA could transfer to the work-related behavior scale.
- Recommendations include repeating the study with different sets of populations to see how they achieve on the CBVA.

- Implications include teaching the set of work-related behaviors and generalized instruction outcomes assessed in the CBVA to individuals with disabilities in career/vocational education.

Bonds, B. G. (2003). School-to-work experiences: Curriculum as a bridge. *American Annals of the Deaf*, 148(1), 38-48.

- Describes school-to-work (STW) as an umbrella term for all activities, experiences, and opportunities that prepare students for work.
- Discusses the need and requirement of career and work-focused individual transition plans (ITPs) for students with disabilities, especially students with hearing impairments (including deafness).
- Described the STW process for individuals with disabilities as one that should start when school begins (i.e. Kindergarten/Pre-School), rather than in high school.
- Recommends the following for improving curricular elements of a STW program for individuals with hearing impairments (including deafness):
 - Ensure that testing is appropriate
 - Interests and strengths of the student should be at the forefront of transition planning
 - Every grade has opportunities for learning job skills
 - Having high expectations for students
 - Ensuring that teachers have a sense of reality

Bozick, R., & Dalton, B. (June 2013). Balancing career and technical education with academic coursework: The consequences for mathematics achievement in high school. *Educational Evaluation and Policy Analysis*, 35(2), 123-138.

- Examined the relationship between coursework in Career Technical Education (CTE) and math achievement in high school.
- Findings indicated advanced math skills such as solving multi-step word problems was slightly impacted for students who took a larger number of occupational courses on average than their peers who took fewer occupational courses.
- Results suggested that students who earned two or more tech credits whose courses aligned closely with the content taught in academic courses did not demonstrate higher math achievement over their peers not taking this course sequence.
- Recommendations included re-examination of Perkins including curricular restructuring initiatives.

Castellano, M., Stone, J. R., III, Stringfield, S., Farley, E. N., & Wayman, J. C. (2004, July). The effect of CTE-enhanced whole-school reform on student course taking and performance in English and science. St. Paul, MN: *National Research Center for Career and Technical Education*, University of Minnesota.

- Examined the differences in difficulty, quantity, and success of English classes and science classes among students in the CTE-enhanced high schools and the non-CTE-enhanced high schools.
- Results indicated that one of two things happened to students in the CTE-enhanced high schools:
 - They performed better in English and science classes in comparison to the non-CTE-enhanced high school students.
 - They were behind the non-CTE-enhanced students in the first two years of high school, in regards to English and science classes, but closed the gap in the later years of high school.
- Recommendations included repeating the study with a different population as the results from this study can only be generalized to high-poverty, high-minority schools.
- Implications for practice include integrating academics into the CTE curriculum.

Castellano, M., Harrison, L., & Schneider, S. (2008). State secondary career and technical education standards: Creating a framework from a patchwork of policies. *Career and Technical Education Research*, 33, 25-44.

- Examined the secondary CTE standards system of each state.
- Results indicated that of the 49 states (including the District of Columbia) contacted, 30 states indicated they had a statewide CTE standards system (Group A), 11 states were developing or had a partially developed system (Group B), and 8 states had no statewide CTE standards systems whatsoever (Group C).
- Results indicated that 22 states in Group A and 9 states in Group B reported that they provided ongoing state funding towards CTE programs.
- Results indicated that 12 states in Group A had a statewide postsecondary technical standards system, and that 10 of these states had aligned this to their secondary CTE standards system.
- Results indicated that 18 states from Group A and 4 states from Group B had crosswalked their academic standards with their CTE courses.
- Recommendations include researching how CTE standards systems are being developed in states and how they are addressing policy elements of reform.
- Implications include the possibility of standardizing secondary CTE standards across states to provide consistency in measuring Perkins outcomes and comparing these data across states.

Evan, A., Burden, F., Gheen, M., & Smerdon, B. (2013). Explaining variability in high school students' access to and enrollment in career academics and career theme clusters in Florida: Multi-level analyses of student and school factors. *Career and Technical Education Research*, 38(3), 211-243.

- Examined school districts' offerings of career academics and evidence of clustering in geographic areas of the state
- Examined the likelihood of certain types of schools to host career academics.
- Examined the likelihood of certain types of students to enroll in career academics and the particular career clusters in which they were most likely to enroll.
- Results indicated that half of Florida's districts offered career academics. There was also evidence of spatial clustering within the state of Florida in regard to career academic offerings.
- Results indicated that students enrolled in a district that had a career academy were more likely to attend a career academy than students whose district did not offer one. Having a career academy in the district, however, did not guarantee a student of acceptance into the program—rather, acceptance was more a factor of demographics.
- Recommendations include repeating the study to examine access to career academics across geographic and social boundaries.
- Implications include providing equal access to career academics to students across geographic and social boundaries.

Gentry, M., Rizza, M. G., Peters, S., & Hu, S. (2005). Professionalism, sense of community, and reason to learn: Lessons from an exemplary from a career and technical education center. *Career Technical Education Research*, 34, 81-102

- Examined the perceptions and experiences of students in career and technical education (CTE) settings and career centers where they attended for a half-day every day of the school year.
- Results indicate three central themes revealed by the data analysis: professionalism, sense of community, and reasons to learn.
- Results indicates that several things separated career centers from traditional high school settings:
 - Students in this setting experienced content from a relevant (to them) career, and real-world perspective. They studied with others who were interested in a similar topic.
 - Students received professional treatment and respect from adults at the center, where learning was focused, but informal. Adults gave students responsibility and treated them with respect and care. Students responded in kind.

- Resources, speakers, and experiences outside of the classroom were common and viewed by all participants as integral to the programs of study.
- Academics were balanced with hands-on learning, which had great appeal to the students in the study. Further, content was studied in the context of interesting career possibilities, and the programs offered meaningful choices to students.
- Instructors and adults knew their students, showed genuine interest in them as people, and worked to solve problems. There was a distinct absence of a traditional teacher as person with power, and a distinct presence of a program manager who worked with young adults as a mentor-type guide.
- The staff and students at the center had access to, and used high tech equipment. Both faculty and students appreciated the facility, technology, and equipment that the facility offered to support learning.
- Faculty seemed unusually qualified and skilled, exhibiting considerable professional and educational expertise. All but one teacher at the center had obtained a master's degree, whereas nationally, only 42% of teachers have attained a master's degree (NCES, 2003).
- Finally, students spent large blocks of time in their programs—at least 2.5 hours per day for 2 years. Programs consisted of classroom, lab, and field experiences.
- Recommendations for future research include further examination of student perceptions in different CTE settings.
- Implications for practice include integrating the above criteria of career centers into traditional CTE.

Gottfried, M.A., Bozick, R., Rose, E. & Moore, R. (2016). Does career and technical education strengthen the STEM pipeline? Comparing students with and without disabilities. *Journal of Disability Policy Studies*. 26(4), 232-244.

- Examined what CTE experiences secondary students with disabilities were engaging in and whether these experiences increased the odds of majoring in a STEM (Science, Technology, Engineering and Math) field of study in college.
- Investigated differences in the number of students with and without disabilities who majored in a STEM (Science, Technology, Engineering and Math) and non-STEM field of study in their college enrollment.
- Findings indicated students with disabilities are less likely to enter college than the general population; however, of those who do enter college, it appears they pursue STEM (Science, Technology, Engineering and Math) fields of study at the same rate as students without disabilities.

- Results indicated students with disabilities took fewer advanced math and science courses and applied STEM courses in high school than students without disabilities.
- Results indicated that for students without disabilities, there is strong evidence that school-based Career Technical Education curriculum and CTE programs are effective at supporting students' movement through the STEM pipeline; however, curricula and programming do not appear to be effective at supporting students with disabilities in pursuing the STEM pipeline.
- Implication for practice included improved preparation of students with disabilities for postsecondary education schools and programs, in addition to rethinking how CTE is designed and implemented in the context of high school STEM curricula so that it will lead to students with disabilities pursuing STEM majors in colleges.

Hughes, K. L., & Karp, M. M. (2004). *School-Based Career Development: A Synthesis of the Literature*. Institute on Education and the Economy, Columbia University.

- Examined literature of school-based career development if studies clearly addressed the study question: "Is there evidence that career guidance programs influence students' academic and vocational achievement?"
- Describes school-based career development literature in terms of the following categories:
 - Comprehensive Guidance Programs
 - Career Courses
 - Counseling Interventions
 - Computer-Assisted Guidance
- Recommendations included that further research should focus on exploring guidance interventions and student behaviors, as well as their relationships.

Johnson, A. B., Charner, I., & White, R. (2003, January). *Curriculum integration in context: An exploration of how structures and circumstances affect design and implementation*. St. Paul, MN: *National Research Center for Career and Technical Education*, University of Minnesota.

- Examined curriculum integration models in order to assess the quality of integration-related reforms at the classroom level and identify best practices for promoting desired student outcomes.
- Results indicated that contextual factors had considerable implications for the shape, scope, and quality of curriculum integration. Specifically the following was found:
 - Curriculum integration appears difficult in settings that are focused on multiple occupation areas rather than a single area.
 - Curriculum integration appears most effective when both academic and vocational instruction occur at the same site.

- Curriculum integration is difficult when multiple high schools contribute students to a single regional tech center, vocational high school, and/or career programs.
- Effective curriculum integration is achievable when individuals in leadership roles are innovative, adaptable, and willing to take risks.
- Resource investment is necessary when developing, supporting, sustaining, and expanding curriculum integration efforts.
- Recommendations include the need for future research examining school administrators rating their school’s curriculum integration efforts against elements of the definition and the definition as a whole.
- Implications include using the findings of this study to help integrate curriculum in the CTE setting.

Knight, D., & Rieck, W. (1997). Contracts for careers. *Teaching Exceptional Children*, 29(6), 42.

- Describes Contracts for Careers as a program that improved the academic performance and employment of students with disabilities.
- Describes the commitment of the stakeholders as follows:
 - Students must maintain an absence rate below 10%, have no course failures or suspensions, and must maintain a job.
 - School must assist in providing part-time employment, supervising employment, providing employability skills, providing intensive guidance, providing vocational awareness, and providing field trips.
 - The state must assist in providing part-time employment, as well as provide guaranteed full-time employment at graduation.
- Recommendations include providing more vocational and career education for students with disabilities.

Loera, G., Nakamoto, J., Oh, Y. J., & Rueda, R. (2013). Factors that promote motivation and academic engagement in a career technical education context. *Career and Technical Education Research*, 38, 173-190.

- Examined features of the CTE model to predict academic engagement and student life satisfaction.
- Results indicate that students’ perceptions about the quality and effectiveness of a CTE program influences their decision whether to join the program. They also found that to increase student participation in CTE programs, CTE programs should be known for college and career preparation or be staffed with teachers and adults who will encourage and mentor students.
- Recommendations for future research include follow-up studies that look at curriculum integration across academic subjects and CTE to compare with non-CTE programs.

- Implications suggest that role models (teachers, counselors, community mentors, etc.) be engaged and invested in students' success and educational experience.

Mccooy, S. (1987). CPVE: A launch for life? *British Journal of Special Education*, 14(4), 153-155.

- Describes the Certificate of Pre-Vocational Education (CPVE) as a program consisting of three parts: core, vocational studies, and additional studies.
- Describe the core areas as: personal and career development; industrial, social, and environmental studies; communication; social skills; numeracy; science and technology; information technology; creative development; practical skills; and problem solving.
- Describe the vocational studies as business and administration services, technical services, production, distribution, and services to people that are examined in three stages (introductory, exploratory, and preparatory).
- Describes additional studies as opportunities for community interaction, leisure, or reflection that allow for educational needs to be met that are not achieved through core or vocational studies.
- Describes CPVE as an appropriate program for students with disabilities, although not data has been collected regarding the participation of students with disabilities in CPVE.
- Recommends that access and additional support be provided for students with disabilities.

Minskoff, E. H., & DeMoss, S. (1993). Facilitating successful transition: Using the TRAC model to assess and develop academic skills needed for vocational competence. *Learning Disability Quarterly*, 16(3), 161-170.

- Describes secondary-level programs for students with learning disabilities in terms of mild learning disabilities, moderate learning disabilities, and severe learning disabilities.
- Describes vocational education for individuals with learning disabilities as something that all students can participate in, but that for students with disabilities vocational education should be included in their IEP and ITP.
- Describes that intersection of vocational education and special education, and how vocational education for students with disabilities can relieve some of the academic pressure faced in traditional secondary education.
- Describes the Trade Related Academic Competencies (TRAC) model as a comprehensive rehabilitation service including vocational training to all types of people with disabilities.
- Describes the following goals of the TRAC program:

- Track analysis of the reading, writing, and arithmetic competencies needed for successful completion of the most frequently offered vocational education areas
- Identification of generic academic competencies
- Identification of lists of vocabulary needed to master the vocational areas
- Development of criterion-referenced assessment techniques for assessing mastery of academic competencies of the vocational education areas and the generic competencies for the purpose of pretesting and posttesting after vocational education
- Identification and development of instructional methods and materials for training academic competencies in vocational education areas and generic competencies
- Describes the following steps for creating TRAC lists for vocational areas that do not already have such a list:
 - 1) Special educator determines that the curriculum being considered adheres to a competency-based vocational education format
 - 2) Special educator obtains master list of reading, writing, and arithmetic tasks to analyze the specific academic skills required
 - 3) Special educators and vocational educators review each performance objective, enabling performance objective, and criterion-referenced measure for each stated vocational task in the targeted curriculum
 - 4) Special educator develops a trade-related academic task list for the targeted occupational area from the tasks in step 3
 - 5) Special educator reviews with the vocational educator the trade related task list and makes changes as needed
 - 6) Special educator designs a pre-post test and/or other curriculum materials to support instructional efforts for the identified tasks
 - 7) Academic skills list is reviewed and revised with the rest of the vocational curriculum as part of the ongoing vocational education systems design/competency-based vocational education process
- Describes the use of the TRAC model and test-teach-retest.

Park, T. D., Santamaria, L. A., Keene, B. L., & van der Mandele, L. (2010). Reading Frameworks in CTE: Pilot Study Findings. *Techniques: Connecting Education and Careers (J1)*, 85(5), 42-44.

- Examined the effects of three literacy instruction methods (control condition, CTE Reading framework, and MAX teaching framework) on high school students' literacy achievement.

- Results found that use of the literacy instruction methods within the CTE setting had a more positive effect on students' literacy achievement (reading comprehension and vocabulary development) than the control group.
- Recommendations include repeating this study with younger high school students to evaluate how literacy-enhanced CTE instruction impacts learning throughout high school.
- Implications for practice include integrating authentic literacy instruction (i.e. MAX) into the CTE instruction to help students achieve higher on literacy based skills testing.

Pearson, D., Richardson, G. B., & Sawyer, J. M. (2013, December). Oregon applied academics project: Final report. Louisville, KY: *National Research Center for Career and Technical Education*.

- Described the premise of the Oregon Applied Academics Projects as based on the following questions regarding mathematics instruction after the success of Math-in-CTE:
 - Could a similar model be created for mathematics teachers?
 - Would it be possible to develop an approach for mathematics instruction that uses real-world problems and is complementary to the Math-in-CTE model?
 - Would it be possible for CTE students to have integrated instruction in their CTE courses **and** their mathematics courses?
 - What kind of processes would be needed for the above approaches?
 - What would Professional Development (PD) look like for this?
- Described the curricula as following a problem-based learning approach that formed units which identified and then developed lessons (per the seven-element framework from Math-in-CTE) for the following:
 - Overall goal of the unit
 - General content of the unit
 - CTE concepts addressed
 - Math concepts addressed
 - Oregon math standards addressed
- Described student and teacher feedback on the curriculum as positive and indicated that both groups found it relevant and challenging.
- Described scores of students taking technical math using ACCUPLACER® as improving and gaining math skills throughout the course.
- Recommendations for future implementations of this model include:
 - Establishing a partnership between mathematics and CTE educators
 - Fostering a community of practice
 - Maintaining mathematics as the central feature
 - Adapting instruction
 - Recognizing that mathematics instructors are not CTE instructors

Plank, S. B., DeLuca, S., & Estacion, A. (2008). High school dropout and the role of career and technical education: A survival analysis of surviving high school. *Sociology of Education*, 81, 345-370.

- Examined the links between CTE and core academic courses and how they influence student likelihood of dropping out using the hazards model.
- Results indicated that if entry age to high school was 15 years of age or less and the student had some CTE classes along with core academic courses, the risk of dropout was lessened, but only up to a point. A combination of one CTE class and two core academic classes was associated with the lowest risk of dropout.
- Recommendations for future research include repeating the study to see how access to different kinds of core academic classes (advanced/honors classes, Advanced Placement classes, etc.) affect student dropout rates.
- Implications include allowing students in CTE to take more core academics class to help encourage students to stay in school.

Porter, M. E., & Stodden, R. A. (1986). A curriculum-based vocational assessment procedure: Addressing the school-to-work transition needs of secondary schools. *Career Development for Exceptional Individuals*, 9(2), 121-28.

- Describes traditional assessments in special and vocational education as being based upon standardized tests and work samples.
- Describe curriculum-based vocational assessment (CBVA) as, “A systematic procedure based upon the analyzed needs, purposes, resources, and programming opportunities desired by the local planning agency.”
- Describes the CBVA model used in the Department of Defense Dependent Schools (DODDS)-Germany Region as having committee members providing the following input to the CBVA planning process:
 - The scope and sequence of special and vocational programs in the region
 - The existing DODDS procedure for collecting and processing assessment data for students with disabilities
 - The individualized education program (IEP) development process as applied in the current DODDS system
- Describes the committee members as being committed to using the following considerations in the development of a CBVA model for the DODDS-Germany Region:
 - That data would be reflective of a student’s functional performance level upon completion of a career/vocational activity, course, or work experience
 - That performance would be directly related to instructional objectives embedded within the curriculum

- That assessment data would describe what a student could do as an outcome of instruction and could be used to supplement existing assessment and grading procedures
- That work related behaviors and generalized skills would be assessed as they relate to specific occupational skill areas
- That it is necessary for data to be acquired easily
- That collected data meet requirements for processing and applying assessment information within the DODDS procedures for student evaluation and IEP development
- That assessment formats be simple to use for students, parents, and school personnel
- Describes the CBVA model for the DODDS-Germany region as having three levels of data collection:
 - Level I: Initial assessment, which occurs in middle school, to assess student readiness and awareness of vocational skills
 - Level II: Assessment activities begin as the student progresses to high school vocational coursework
 - Level III: Assessment activities as student performs work-related skills and behaviors in work experience programs
- Discusses how assessment data are received and discussed by each course instructor to help develop an appropriate and useful IEP by creating data-based IEP goals and objectives as well as using data-based decisions to develop instructional modifications and accommodations.
- Recommends that the CBVA model implemented in DODDS-Germany Region should be used in more schools to help record data of the program's effectiveness in helping students with disabilities transition to the world of work.

Rubin, S., & Ramaswami, S. (2013). In what ways is the New Jersey vocational school admissions criteria a predictor of student success on state mandated tests. *AASA Journal of Scholarship and Practice*, 10, 46-67.

- Examined the extent to which the admission criteria of NJCVTS (New Jersey County Vocational Technical-School District) predict student achievement on state mandated language areas and mathematics.
- Results indicated that middle school grades were the strongest predictors of future GPA in students who attended the NJCVTS. They also indicated that the strongest predictor of a student's success, as measured by the SAT, was a student's score on the NJCVTS admissions exam.
- Recommendations for future research included replicating the study while breaking down middle school GPA by subject to see if there are correlations based on subject and achievement.
- Implications include targeting struggling students in middle school to help them achieve admission into NJCVTS.

Stone, James R., I., II, Alfeld, C., & Pearson, D. (2008). Rigor and relevance: Enhancing high school students' math skills through career and technical education. *American Educational Research Journal*, 45(3), 767-795.

- Examined a math-enhanced CTE curriculum and its ability to improve student math performance, as assessed by traditional and applied mathematics tests, and if it decreased students' likelihood of needing remedial mathematics in postsecondary education.
- Examined a math-enhanced CTE curriculum and its effect on student acquisition of SLMP (specific labor market preparation) technical skills and/or knowledge.
- Results indicated that a math-enhanced CTE curriculum increased student performance on mathematics tests while potentially lessening the need for mathematics remediation in postsecondary education.
- Results indicated that on average, a math-enhanced CTE curriculum did not affect student acquisition of SLMP technical skills and/or knowledge.
- Results indicated that five core principles of math-enhanced CTE curriculum emerged after qualitative analysis:
 - Develop and Sustain a community of practice among the teachers
 - Begin with the CTE curriculum and not the math curriculum
 - Understand that math is an essential workplace skill
 - Maximize math in the CTE curriculum
 - Recognize that CTE teachers are teachers of math-in-CTE, and not math teachers
- Recommendations included repeating this study without providing financial incentives and developing professional development related to math-enhanced CTE curriculum, support, and materials to test if the intervention would be as successful.
- Implications included fully integrating math within the CTE curriculum (i.e. math and CTE teachers working together) for more significant effects on math knowledge and reduction of remedial math in postsecondary education.

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