



2007–2012

IMPACT REPORT

p8

Co-Authored Report
Identifies Best Education
Pathways Out of the
Jobless Recovery

p14

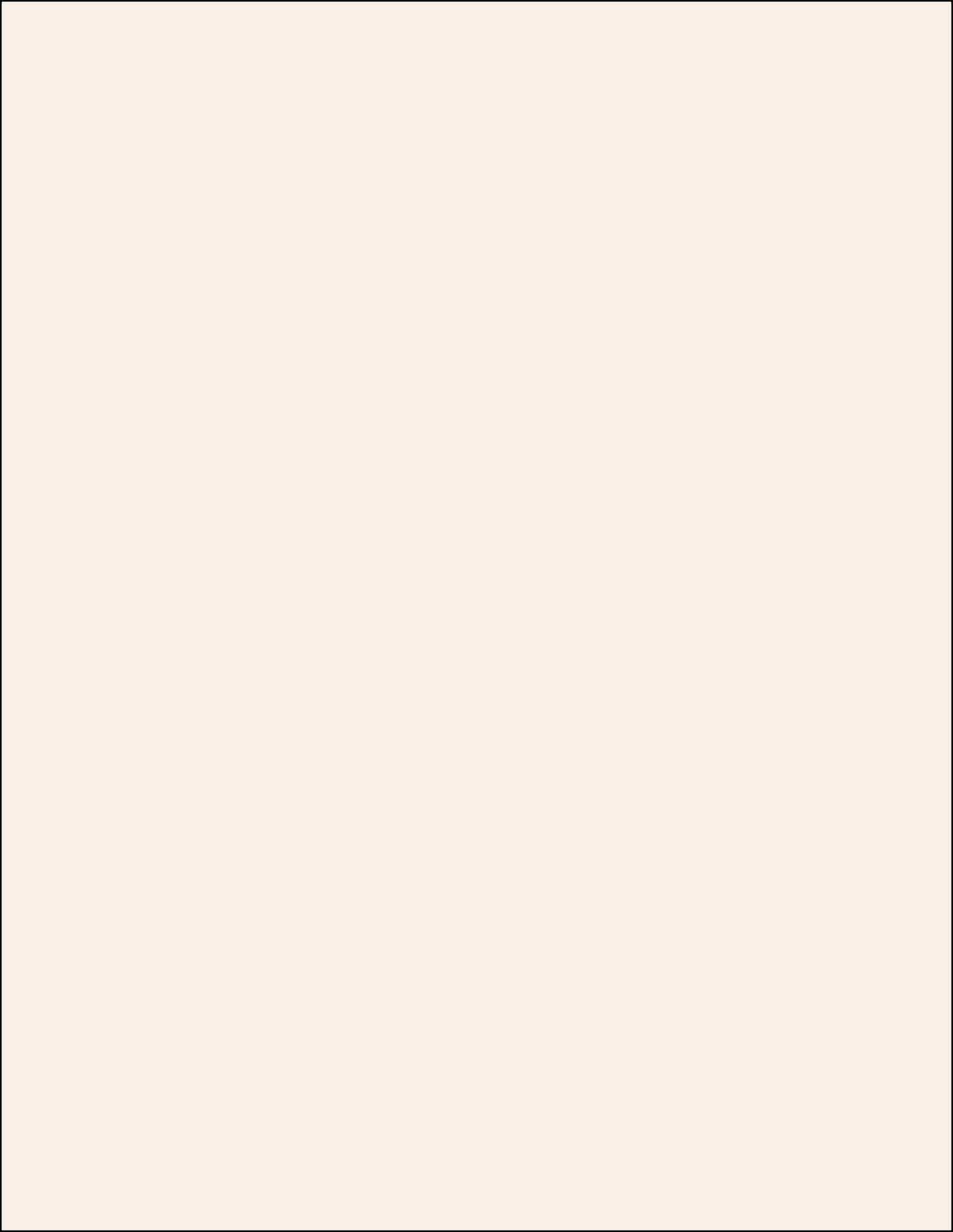
NRCCTE Research
Published in *Educational
Evaluation and Policy
Analysis*

p19

NRCCTE Study Examines
Return on Investment for
CTE and Workforce
Development Programs

p25

NRCCTE
Cited in the
*New York
Times*



a letter from the director

THIS IMPACT REPORT REPRESENTS an executive summary of the research, dissemination, technical assistance, and professional development activities conducted by the National Research Center for Career and Technical Education (NRCCTE) during its five years of operation at the University of Louisville (2007-2012). Additional detail on the NRCCTE's activities can be found on our website, www.nrccte.org, and in our many published research reports, multimedia products, and formal reports to our funding agency, the Office of Vocational and Adult Education (OVAE) at the U.S. Department of Education, and the United States Congress. This impact statement focuses on how the NRCCTE's varied agenda has influenced and continues to influence the national discussion of career and technical education (CTE) and the contribution CTE can make to improve the high school experience and transition to postsecondary education and employment of young people. In these challenging economic times, CTE is more important than ever to the future outcomes of our youth.

We have not undertaken our work alone. The NRCCTE operates as a consortium with the University of Louisville as lead institution

and fiscal agent. Our primary partners are the University of Minnesota, Cornell University, Clemson University, the Association for Career and Technical Education (ACTE), NOCTI, the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the Southern Regional Education Board (SREB), and the National Institute for Work and Learning at FHI 360.

In sharing stories about our work and the impact it has had, we also wish to express our sincere thanks not only to our colleagues at OVAE and our consortium partners, but also to the hundreds—indeed, thousands—of teachers, administrators, students, and parents across the country whose participation makes our studies and projects possible. To all of you who go the extra mile in supporting our mission, we express our deeply felt thanks and appreciation.



James R. Stone III, Ed.D.
Director, NRCCTE

Impact Report

2007–2012



3	A Letter from the Director
5	Our Mission and Work
6	Generating the Evidence Base on College and Career Readiness: NRCCTE Research Programs of Study Curriculum Integration Postsecondary Retention
13	Sharing Evidence-Based Research and Solutions with the Field: Dissemination
16	Evidence-Based Approaches to Improving CTE Programs: Technical Assistance and Professional Development Curriculum Integration Technical Assistance Academy Professional Development for CTE Educators
24	Making an Impact: The Influence of the NRCCTE Research Math-in-CTE National and State Organizations Website and Media



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our mission and work

The National Research Center for Career and Technical Education (NRCCTE), funded by the U.S. Department of Education, Office of Vocational and Adult Education (OVAE), and directed by Dr. James R. Stone III, is the primary agent for generating scientifically based knowledge, dissemination, professional development, and technical assistance to improve career and technical education (CTE) in the United States. The NRCCTE works to improve the engagement, achievement, and transition of high school and postsecondary CTE students through technical assistance to states, professional development for CTE practitioners, and dissemination of knowledge derived from scientifically based research.

To this end, the NRCCTE carries out scientifically based research and evaluation of methods to improve

- the integration of career and technical with academic instruction,
- the integration of secondary and postsecondary CTE,
- the use of education technology and distance learning,
- the transition of CTE participants to high-skill, high-wage, or high-demand occupations, and
- the use of state-adjusted levels of performance to improve CTE programs and student achievement.

The NRCCTE also seeks to identify the academic knowledge and career and technical skills required for employment or participation in postsecondary education, to increase

the effectiveness of CTE programs that are integrated with coherent and rigorous content aligned with challenging academic standards, and to improve the preparation and professional development of CTE teachers, faculty, and administrators in order to improve student learning.

The NRCCTE conducts work in the areas of research, dissemination, technical assistance, and professional development. Although the NRCCTE is based at the University of Louisville, four research universities—the University of Louisville, the University of Minnesota, Clemson University, and Cornell University—provide the faculty and staff who carry out much of our research. Our partners include NOCTI (formerly the National Occupational Competency Testing Institute), a leading developer of occupational assessments; the National Institute for Work and Learning, a unit of FHI 360, which focuses on the linkages between education and employment systems; and the Southern Regional Education Board (SREB), which administers High Schools that Work (HSTW), an educational reform initiative that is being implemented in over 1,200 high schools in 31 states. Practitioners are represented by the Association for Career and Technical Education (ACTE), our primary dissemination partner, and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc). All of these partners work to address issues of high concern to policymakers as well as to those who have the day-to-day responsibility for delivering CTE to young people and adults.

GENERATING THE
EVIDENCE BASE ON
College
AND
Career
READINESS:

NRCCTE Research

*Over its five-year funding history (2007-2012),
the NRCCTE has sponsored 13 research studies.*

The NRCCTE's research focuses on issues of urgency to both the field of CTE and the nation's higher education system, recovering economy, and evolving labor market, with topics including programs of study (POS); curriculum integration of academic content knowledge and skills (math, science, and literacy) with CTE; postsecondary student engagement, achievement, and transition; and professional development for CTE educators in the areas of data use for program improvement and support for CTE educators entering the teaching profession through an alternative route. Principal investigators of NRCCTE studies in these areas have also conducted cross-project collaborative research projects with one another that have generated major cross-study publications.

PROGRAMS OF STUDY

Programs of study are the most significant new initiative in Perkins IV. As of the publication of this

impact report, the NRCCTE continues to fund three longitudinal field-based studies and has completed one descriptive study examining the implementation and effects of POS. Ongoing studies of POS include an analysis of mature postsecondary programs, rigorous tests of the effectiveness of POS using experimental and quasi-experimental designs, and an assessment of state-mandated POS in South Carolina. The concluded descriptive study examined the status of POS implementation in six states.

Current reports related to each of these studies, including the latest results and findings, can be found at www.nrccte.org.

Mature Programs of Study: A Postsecondary Perspective. Although POS were first mandated in 2006, there have been a variety of prior federal, state, and local initiatives that attempted to assist CTE students in making the transition from secondary to postsecondary education. This study seeks to identify the components of POS implementation in "mature" sites; that is, it seeks to learn about the processes, policies, structures, key players, challenges, and solu-



tions involved in mature POS. Researchers are using a combination case study and backward mapping approach that was designed to examine and report how POS were developed and how they are being sustained locally in selected mature sites. Researchers from FHI 360 used a variety of methods to identify eight sites that could document that their students were successfully moving from high school to college in POS. Four of the eight sites met the criteria for the research project and three agreed to participate in the study. Data collection began at the three sites in the spring of 2009.

Rigorous Tests of Student Outcomes in CTE Programs of Study. This project, conducted by NRCCTE staff, uses rigorous research methods (e.g., random assignment and propensity score

matching to assign students to treatment and control or comparison groups) to examine the effects of POS on student achievement outcomes. In conducting random assignment studies in public education, it is necessary to identify programs that have the features of interest (i.e., POS) for which more students apply than can be admitted and that use a lottery to select those who will receive the desired programs. NRCCTE researchers identified two school districts that offer multiple POS, use lotteries to admit students, and agreed to participate in a study of the effects of those programs. The project identified another similar district that agreed to participate in a quasi-experimental component of the larger study that matched POS students with similar students enrolled in high schools that do

It's easy being green: CTE programs in horticulture give students hands-on experiences that translate to careers in agriscience, biology, and environmental science.

photo by ACTE

not offer such programs. Data on the outcomes of interest are being collected in these three districts. Yearly site visits provide the opportunity to interview stakeholders and describe both the fidelity of implementation at the treatment schools and the counterfactual condition at the control or comparison schools.

Programs of Study as a State Policy Mandate: A Longitudinal Study of the South Carolina Personal Pathways to Success Initiative. In 2005, South Carolina passed the Education and Economic Development Act (EEDA), a statewide education

reform policy that requires career-focused POS for all students across the high school curriculum. The similarity of these POS to those required by Perkins IV provided a unique opportunity to study the implementation and impact of highly aligned state and federal legislation. Researchers from the National Dropout Prevention Center at Clemson University are studying the impact of EEDA-mandated POS on eight high schools selected to represent diversity in the degree of policy implementation as well as in size, location, and the demographic and economic base of the geographic areas that they

SPOTLIGHT PUBLICATION

Co-Authored Report Identifies Best Education Pathways Out of the Jobless Recovery

The NRCCTE collaborated with the Georgetown University Center on Education and the Workforce and the NASDCTEc to release a comprehensive report, *Career Clusters: Forecasting Demand for High School Through College Jobs, 2008-2018*, that identifies 16 career clusters that represent the full array of related occupational opportunities and education requirements. Report findings indicate that for those with high school diplomas, decent jobs still exist, but there are not enough to go around. Only one in three of high school-level jobs will pay wages of \$35,000 or more; in some cases, with experience, these jobs can provide wages up to \$50,000.

High school-level jobs are found in four male-dominated career clusters: manufacturing, construction, transportation, and hospitality. Of these four clusters, only jobs in manufacturing and construction still pay relatively good wages, particularly for those who ob-

tain on-the-job-training. The study confirms that women need postsecondary education to earn the same wages as men with only a high school diploma. For instance, whereas a man can earn \$35,000 with a high school diploma in the manufacturing career cluster, a woman must obtain a postsecondary credential and work in healthcare to earn as much.

In many industries, the overall number of jobs will decline through 2018, but there will still be job openings available due to retirement. For example, the report finds that there will be 181,000 fewer manufacturing jobs over the coming decade, but there will be 3 million job openings in manufacturing by 2018.

Middle-skill jobs have promise for those who acquire some level of postsecondary education or training but not a bachelor's degree. For women, middle-skill jobs are the minimum threshold for a better career. One in two of these middle-skill jobs provide career pathways leading to median wages of roughly \$40,000. Such jobs are concentrated in six career clusters: manufacturing, marketing, transportation, healthcare, business, and hospitality. The fastest growing career clusters for middle-

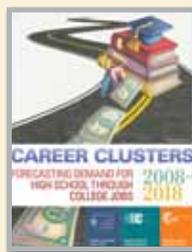


Careers in health-care and STEM-related fields are among the fastest growing nationally.

skill jobs are in healthcare (21%) and hospitality (12%).

Workers with bachelor's degrees and graduate degrees have the most positive outlook. Five out of six jobs available for workers with a bachelor's or better pay more than \$35,000

a year; the average wage is \$60,000. Seventy-two percent of jobs available for workers with a bachelor's degree or better are found in nine occupational clusters. At this education level, all career clusters are essentially accessible.



In addition to the full national report, *Career Clusters* contains an executive summary and a state-level analysis of jobs by career cluster. All three documents are available online at <http://cew.georgetown.edu/Clusters>.

Learn more and download a companion podcast recorded by Dr. Pradeep Kotamraju at <http://bit.ly/uEB5EK>.

Read an article published about the report in the *Chronicle of Higher Education* at <http://bit.ly/wnnx95>.

serve. Data are being collected from three cohorts of students with different levels of exposure to the reforms mandated by EEDA: those who graduated in 2009, who had little exposure, and those whose on-time graduation will be in 2011 and 2014. Students from these three cohorts have and will complete surveys; a small sample from the class of 2011 participated in focus groups. Additional data are being obtained from the state educational database including grades, test scores, attendance, disciplinary incidents, and graduation. These data are supplemented with surveys, interviews and focus groups with administrators, teachers, and guidance counselors.

Six Stories in Six States: Programs of Study.

Researchers from the University of Minnesota conducted site visits to six states and local districts within those states to describe the implementation of POS during the first half of 2010. Neither the states nor the local districts visited in each were randomly selected (the states selected represented a purposive sample chosen based of their geographic and administrative heterogeneity and the recommendations of individuals who were knowledgeable about the implementation of POS). The project's case study report describes how the six states were developing POS and focuses on how states' technical assistance systems evolved and what successes and challenges existed. Researchers sought to identify those elements the states held in common and those that were unique to each state.

Programs of Study: A Cross-Study Examination of Programs in Three States. This cross-study project was designed to examine selected programs and sites from each of the NRCCTE's three field-based, longitudinal studies of POS that had the most mature, well-established programs relative to other study sites as a means of identifying common elements or attributes that led to the successful implementation of POS. Site visits were conducted to three sites over the course of the 2010-2011 school year. The researchers identified six major themes derived from the data gathered: (a) engagement, (b) a strong focus on student learning, (c) certification of knowledge and skills, (d) POS connected secondary and postsecondary systems, (e) POS raised the understanding of and respect for CTE among stakeholders, and (f) high-quality teachers made a difference in the delivery of programs. As the renewal of Perkins approaches, the findings from this study may help inform future efforts in the expansion of POS and the creation of an integrated, seamless system of learning engages students in training for work, college, and life.

Programs of Study: A Cross-Study Examination of Programs in Three States



This project was designed to examine selected programs and sites from each of the NRCCTE's three field-based, longitudinal studies of POS that had the most mature, well-established programs relative to other study sites as a means of identifying common elements or attributes that led to the successful implementation of POS. A team of researchers led by Rob Shumer of the University of Minnesota, Sam Stringfield and Natalie Stipanovic of the University of Louisville, and Nora Murphy of the University of Minnesota conducted visits to three sites over the course of the 2010-2011 school year. During these visits, the study team reviewed each site's strengths, identified the contributing factors to their development of POS, and examined their implementation of the 10 supporting elements of POS identified by the U.S. Department of Education, Office of Vocational and Adult Education. After describing the sites, the report identifies six major themes derived from the data gathered at these sites:

- **Engagement:** POS had the power to engage students in learning, primarily by connecting academic learning to meaningful, work-based learning.
- **Strong focus on student learning:** POS were established to ensure that learning, both academic and skills-based, was the primary activity of students.
- **Certification of knowledge and skills:** As mandated, POS led to a variety of certifications from

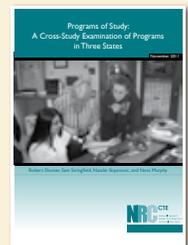
Although the information technology industry is constantly changing, careers in this area are available in all sectors of the economy.

photo by ACTE

business and industry. But academic knowledge also had to meet levels of certification or generate outcomes that could be measured against standards.

- **POS connected secondary and postsecondary systems** with the goal of making CTE a seamless system that starts early in students' educational careers and focuses on both academic and skills-based learning.
- **POS raised the understanding of and respect for CTE among stakeholders.**
- **High-quality teachers made a difference in the delivery of programs.**

This study of three sites selected from the NRCCTE's field-based longitudinal research projects offers important knowledge about how POS work and what needs to be done to continue positive trends in program outcomes and operations. It has also captured many of the strengths of the programs that contribute to engagement, learning, collaboration, and cooperation. As the renewal of the Carl D. Perkins legislation approaches, the findings from this study may help inform future efforts in the expansion of POS and the creation of an integrated, seamless system of learning that will engage students in training for work, college, and life.



To learn more about the team's findings and recommendations for the future of programs of study, download the full report at <http://ow.ly/7Luty>.

Programs of Study: Year 3 Joint Technical Report

Programs of study (POS) were the most significant new requirement in the 2006 reauthorization of the federal legislation for CTE. Consequently, the NRCCTE established as one of its priorities the development of information on the operation and effectiveness of POS. Thus, over its five-year funding period, the NRCCTE has sponsored four research projects that examine POS. Three are currently on-going field-based longitudinal studies that examine POS from different perspectives and employ different methodologies. The fourth project, now concluded, used case study methods to describe how six states were implementing POS during the first half of 2010.

This joint report, written by the principal investigators of all four research studies, presents individual and synthesized

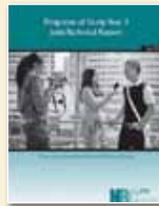
findings, organized according to the four mandated components of POS in Perkins IV and the 10 supporting components contained in the OVAE Design Framework for POS.

The authors found that, across all four studies and their associated sites, at least some of the mandated components of POS were in place or in process, but at the time of writing, it was still too early to determine if these components would produce students who are more likely to graduate high school, be prepared to continue their education or training, and earn industry-recognized credentials or postsecondary degrees in their fields of interest. The implicit theory underlying POS is that a clear career focus increases engagement and improves academic performance so that students experience a smoother transition between educational levels and to employment. The NRCCTE's longitudinal studies were designed to complement each other and to test portions of this theory by focusing data collection and analysis on student and school outcomes

at varying stages of the POS process.

Across all four studies, it was also frequently noted that initiatives similar to POS have been going on for many years. The authorization of Perkins IV, and in South Carolina both the Education and Economic Development Act (EEDA, passed in 2005) and Perkins IV, brought these efforts to the forefront of educators' agendas and therefore made them more tangible and concrete. Instead of just written articulation agreements, real connections were seen to be emerging between high school and college faculty and between course content at all levels, and relationships were developing that were encouraging a spirit of collaboration. Businesses were more actively connected to program development and

Read the full report (<http://bit.ly/oR3oA1>) or listen to a companion podcast with study co-author Morgan Lewis (<http://bit.ly/oRlRpgs>).



CURRICULUM INTEGRATION

Two research projects conducted by the NRCCTE during its 2007-2012 funding period examined methods of increasing the academic skills of secondary CTE students.

Authentic Literacy in CTE. Perkins IV requires that POS include “coherent and rigorous content aligned with challenging academic standards.” The reading skills of many CTE students make it difficult for them to meet such standards. In Spring 2009, researchers at Cornell used a random assignment experiment to pilot different approaches to improving student reading skills as part of the regular CTE curriculum. Students who received this instruction scored higher on the Gates-MacGinitie standardized reading test than students without such exposure.

The pilot test results led to the decision to conduct a full school-year test of MAX Teaching and the ALS Framework. During the summer of 2009, 116 teachers from New York and South Carolina were recruited and randomly assigned

to one of these approaches or the control group. Those in the treatment groups received training in the implementation of the strategies used by each approach to improve reading. Approximately 2,700 students were pre- and posttested in the fall of 2009 and spring of 2010. Students in both experimental groups scored 9% higher on the posttest than those in the control group. For a subgroup of teachers who participated in the pilot study and the full-year study, their students scored 7% higher than the students of experimental teachers who participated in only the full-year study and 17% higher than the control group. Teachers who had more experience with the intervention produced stronger student effects.

Science-in-CTE. This study is testing the effects of enhanced science instruction in agricultural and health science courses following the general model pioneered by the Math-in-CTE study. A pilot study conducted in North Dakota during the 2009-2010 school year found no significant difference between the experimental and control groups on TerraNova

tests of science achievement. When posttest data were analyzed, however, experimental students who had pretest scores in the upper three quartiles had significantly higher posttest scores than control students in these quartiles. This intriguing finding suggested that there were aspects of science instruction that were not addressed by the modified version of the Math-in-CTE approach used in the pilot study. A panel of science experts was convened to review the methods used to enhance science instruction and recommended an increased emphasis on teaching inquiry. To accomplish this, the first two elements of the model's framework were revised to more clearly situate lessons in the CTE content and a real-world context.

The revised framework was then tested during the 2010-2011 school year with agriculture and health science teachers who were recruited and randomly assigned to control and experimental groups. The experimental CTE teachers received the professional development and integrated these lessons they developed with their science teacher partners into their regular curricula. Pretesting was conducted at the start of the spring 2011 semester, prior to the teaching of the science-enhanced lessons, and posttesting was conducted near the end of the school year. The data from these tests are being analyzed and results will be reported in 2012.

POSTSECONDARY RETENTION

Another on-going research study is collecting data on programs to improve the achievement and retention of postsecondary occupational students.

Relative Impact of Interventions to Improve Achievement and Retention in Postsecondary Occupation Programs. Researchers from the University of Minnesota and the University of Louisville are cooperating in a study of initiatives to improve achievement, retention, and program completion for students studying occupational programs in community colleges.

The study is examining relationships among non-malleable variables (e.g., age, gender), malleable variables (e.g., participation in developmental education, advising, tutoring), and student achievement and retention outcomes for two cohorts of students at four public community colleges in four different states. The purpose is to examine what works for whom. Cohort 1 (5,674 students) entered college in Fall 2009 and Cohort 2 (5,733 students) entered college in Fall 2010. Site visits to these colleges and interviews with administrators identified the following 12 intervention programs at two or more of the four sites:

- Orientation programs and courses

- Advising
- Early alert/warning systems
- College success courses
- Developmental education
- Learning communities
- Online courses
- Hybrid courses
- TRIO: Student Support Services participation
- Financial aid
- Tutoring
- Career exploration courses

Data are being obtained from institutional records on student characteristics, course completion, grades, and program completion. Analyses attempt to identify what types of interventions are correlated with retention and completion for which types of students. Institutional data are being supplemented with surveys of selected samples of students. Initial data analyses from the 2009-2010 academic year suggested that students who availed of advising or tutoring were more likely to be retained. In addition, retention was higher for students who received a grant or loan to attend college, and for those who took developmental (remedial) mathematics classes. As additional data are collected and analyzed, it will be possible to examine the question of what types of intervention programs most strongly correlate with retention for which students.

TECHNICAL ASSISTANCE UPDATE

Oregon launches Literacy-in-CTE

Oregon became the first state to launch a full implementation of the Literacy-in-CTE curriculum integration model. After a successful pilot in Detroit last year, the NRCCTE began offering Literacy-in-CTE technical assistance, beginning with the 2011-2012 school year. At Oregon's summer professional development session, 26 teachers and administrators and 11 English/Language Arts teachers received training on 12 literacy strategies. Each teacher demonstrated at least three lessons for their peers—two with teachers from their own CTE content area, and one with a group of teachers from mixed content areas.

"On Wednesday, there was a very real switch in the demonstrations," said Jennell Ives, Oregon

CTE Education Specialist. "Teachers began experimenting with creating more student-centric lessons and creating opportunities for deeper thinking and connection... In Oregon, the CTE teachers will be the lead in implementing the literacy common core standards in several schools because of the Literacy-in-CTE training."



Travis Park, NRCCTE facilitator, explains literacy strategies.

photo by NRCCTE



Programs in architecture and construction lead to careers addressing all aspects of the built environment.

SHARING
EVIDENCE-BASED
Research
AND **Solutions**
WITH THE FIELD:

Dissemination

The NRCCTE's main partner in dissemination is ACTE, the nation's largest professional association of CTE educators, with almost 30,000 members. This partnership helps the NRCCTE connect with these educators and other stakeholders through our website, exhibits and presentations at conferences, and a variety of electronic and print products. Products include formal research and technical reports, short Research Snapshots, *CenterPoint* and From the Director newsletters, interactive webinars, videos, and audio podcasts on a variety of topics.

Beyond its range of web-, print-, and conference-based dissemination activities, the NRCCTE also funds a number of projects in its broader dissemination portfolio: Systematic Reviews of Literature; Vanguard, Promising, and Practitioner Wisdom Practices; and a suite of services under the heading of CTE Accountability and Evaluation: (a) Measuring CTE Effectiveness by Using Return on Investment and Other Related Tools; (b) the Inventory of Technical Skills Assessments; (c) the Cross-walk Validation Project; and (d) the now-concluded Common Postsecondary Data Dictionary.

Systematic Reviews of Research. Each year, the NRCCTE conducts one or more systematic reviews of the literature on a selected topic to summarize the best available studies and present what is known and what needs additional research. Each of these reviews includes a thorough and unbiased literature search, detailed coding using a tested coding protocol, an assessment of study quality, and a valid synthesis of study results. The topic addressed during 2010-2011 was the effect of participating in CTE, broadly defined, on the educational, attainment, and labor market outcomes of students.

To conduct this review, the research team identified over 7,000 studies that may have been relevant and at least two researchers evaluated the titles and

abstracts to determine if they met the study criteria. Ultimately, 94 documents were retained as eligible for inclusion, of which over 50 were partially coded (for their effect sizes and major study characteristics) and primary analyses conducted. A large number of different kinds of outcomes were measured in the studies included in the review, but six categories of outcomes were most common: grades, achievement test scores, attendance, graduation, postsecondary enrollment, and employment. Researchers conducted a total of six different meta-analyses, one for each of these outcomes.

Overall, the results of these preliminary analyses are promising in that they suggest that studies of CTE experience, on average, are associated with effects that are positive in direction and either reach or come close to reaching traditional levels of statistical significance. That said, more research needs to be done. Only one study used a random assignment scheme to form groups, and most (around 70%) failed to match or use statistical controls in an effort to improve estimation. Further, although they represented the “best” studies in our analysis, “best” is a relative term; most studies that use statistical controls employed variables that are relatively easily obtained, as opposed to variables that might actually inform the selection process or are causally prior to CTE participation. The nature of the existing evidence limits what can be said about the effects of CTE on the educational and labor market outcomes of students.

Vanguard, Promising, and Practitioner Wisdom Practices. The NRCCTE has a continuing initiative to identify and publicize practices that appear to have much potential but have received little attention outside of local areas. For the first three years of the NRCCTE, this project searched for viable practices in a variety of forums. All promising programs identified were submitted for reviews by a panel of educators using a standardized rubric. By the end of 2010-2011, this review process resulted in the selection of seven practitioner wisdom practices that are accessible on the NRCCTE website.

Also in 2010-2011, the NRCCTE added a Vanguard Practices component to the project to examine those CTE practices that are linked to improved achievement of high school students.

The project uses grounded theory with the measure of effectiveness being graduation rate at the school level. Grounded theory reverses the traditional scientific approach in that rather than testing hypotheses derived from theory, it seeks patterns and themes in data on which an explanatory theory can be built. Using graduation rate as the effectiveness measure allowed the NRCCTE to contrast stu-

RESEARCH IN FOCUS

NRCCTE research published in *Educational Evaluation and Policy Analysis*

Keeping At-Risk Students in School: A Systematic Review of College Retention Programs,” by Jeffrey C. Valentine, Amy S. Hirschy, Christine D. Bremer, Walter Novillo, Marisa Castellano, and Aaron Banister, was published in June in *Educational Evaluation and Policy Analysis* (Volume 33, Number 2). A product of the NRCCTE’s Systematic Reviews of Literature project, this paper reports on the project’s systematic review and meta-analysis of studies of college retention programs targeted at students at risk of dropping out. The studies analyzed suggest small but potentially important effects on short-term retention rates and grades

earned by program participants. Studies of more comprehensive interventions using relatively more appropriate comparison groups suggested more effective results than did studies that used weaker interventions, relatively less appropriate comparison groups, or both. The review highlights the need for more investment in rigorous studies that investigate the specific aspects of programs that are associated with program success as well as which types of programs are most effective for which students. The paper is available online to those with personal or institutional subscriptions to EEPA at <http://bit.ly/iGYmxw>.

dents in selected schools and their CTE practices or programs with students outside of those programs as well as students in other schools and districts. Other measures of interest will include GPA and course-taking patterns.

The first step of this project was to identify vanguard practices by requesting nominations from three organizations whose members provide leadership for CTE: SREB/HSTW, NASDCTE, and ACTE. These organizations were specifically asked to nominate CTE practices or schools that they had found to be innovative and that had made a significant impact on student outcomes. Nominations from these organizations, as well as from searches made by NRCCTE researchers, yielded a list of 48 schools that was screened and narrowed to 44. NRCCTE researchers then further screened these 44 practices to select those that would be suitable for analysis using the grounded theory approach, reducing the number of sites to eight. Site visits in 2011-2012 will generate interview and other data that will be analyzed to identify differences in practices and which practices can be linked to graduation rates that are above those of students not in the CTE programs or in comparable schools.

CTE Accountability and Evaluation. A growing effort at the NRCCTE has been to focus more on CTE accountability and evaluation, particularly as researchers, practitioners, and policymakers contemplate a future reauthorization of the Perkins Act. This project develops a comprehensive strategy for technical assistance and dissemination that addresses various aspects and issues that surround CTE accountability and evaluation. Included among the different topics it addresses are (a) developing a guidebook for conducting return on investment (ROI) analyses at the local, agency, and



state levels; (b) building a technical skills assessment inventory; (c) validating crosswalks that link education programs to labor market information; and (d) identifying common data standards for Perkins accountability. More information regarding the NRCCTE focus on CTE accountability and evaluation can be obtained at the NRCCTE website. A proposed intent of this facet of overall NRCCTE dissemination activity will be to provide scientifically based information on current, developing, and future CTE accountability and evaluation systems. The ultimate goal will be the development of inter-related strategies that can help states, community colleges, and school districts add value to their individual CTE accountability and evaluation systems. In so doing, this project is able to serve directly the NRCCTE's intended audiences of practitioners, policymakers, and state agencies.

The Department of Labor projects that healthcare support jobs will grow more than any other occupational category by 2020.
photo by ACTE

RESEARCH IN FOCUS

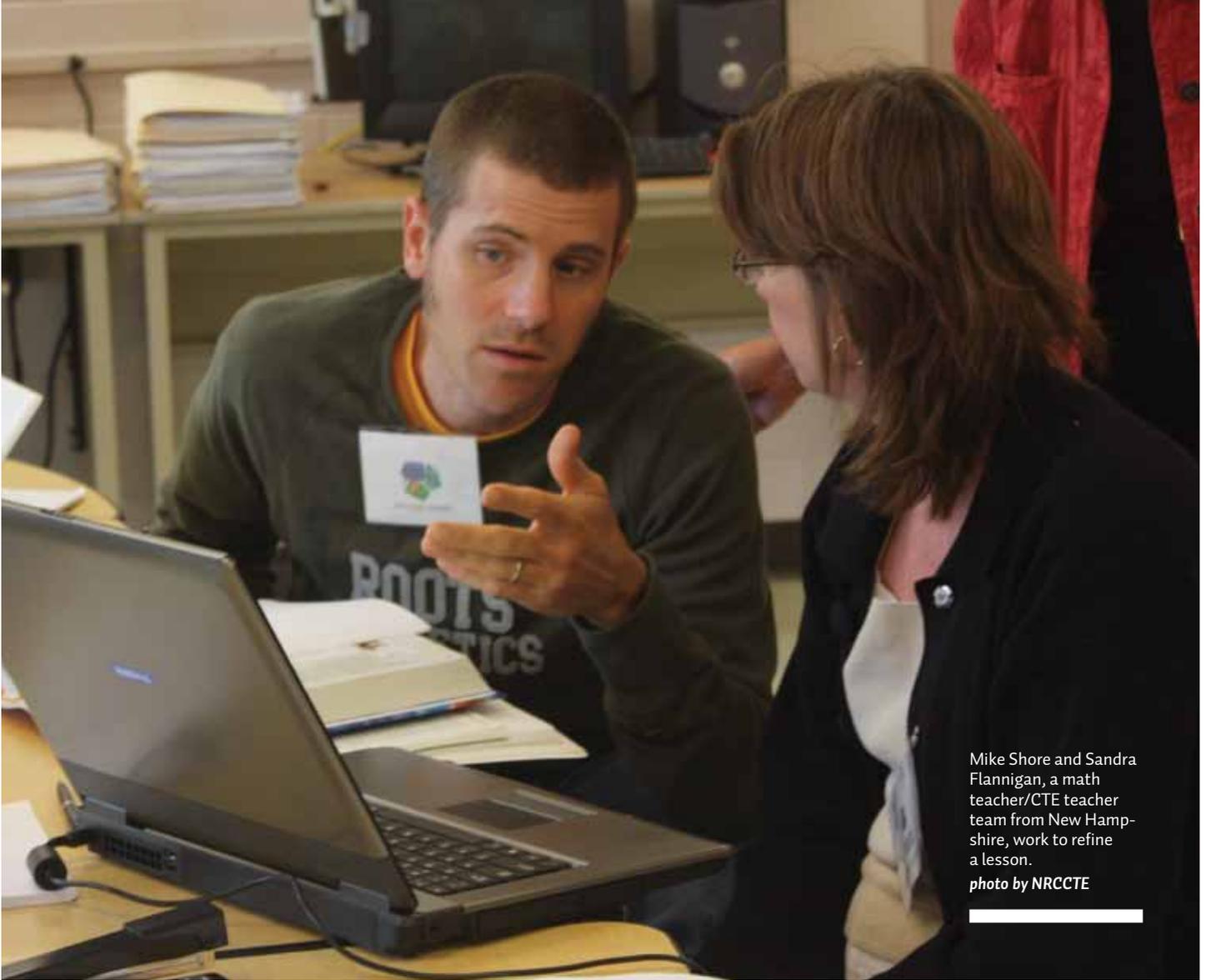
NRCCTE research in *Community College Review*

TCTE students pursuing occupational associate's degrees or certificates differ from students seeking academic majors at two-year institutions in several ways. "Career and Technical Education Student Success in Community Colleges: A Conceptual Model," by Amy S. Hirschy of the University of Louisville, Chris-

tine D. Bremer of the University of Minnesota, and Marisa Castellano of the University of Louisville, examines several theoretical models of student persistence and offers a conceptual model of student success focused on CTE students in community colleges. The article, which appeared in Volume 39, Issue 3 (July 2011) of

the *Community College Review* (see <http://bit.ly/pEgrHP>), is based on the NRCCTE's Relative Impact study of interventions to improve the retention of students in postsecondary occupational education programs.

Learn more about the project and read its most recent report at <http://bit.ly/qQn37t>.



Mike Shore and Sandra Flannigan, a math teacher/CTE teacher team from New Hampshire, work to refine a lesson.
photo by NRCCTE

EVIDENCE-BASED APPROACHES TO IMPROVING CTE Programs

Technical Assistance & Professional Development

The NRCCTE offers technical assistance to help states and large school districts build their capacity to implement what has been learned from scientifically based research and meet the requirements of Perkins IV.

“ [Math-in-CTE is] exactly what we have needed for a long time. Professional development that integrates local curriculum is the place to start with improving student performance. ” —Math-in-CTE participant

Some of our technical assistance is provided by NRCCTE staff, some by faculty at our partner universities, and some by the National Institute for Work and Learning at FHI 360 with the support of NASDCTEc.

CURRICULUM INTEGRATION

The NRCCTE provides technical assistance (on a cost-recovery basis) on the integration of enhanced instruction in mathematics and literacy in CTE courses. Mathematics integration is based on the **Math-in-CTE** curriculum integration model, which was developed and validated by the NRCCTE when it was located at the University of Minnesota. Literacy integration is based on methods developed and tested by faculty at Cornell University as part of work of the current NRCCTE. During its 2007-2012 funding cycle, NRCCTE researchers at Cornell University drew on the Math-in-CTE model to design, test, and refine a new curriculum integration model, **Literacy-in-CTE**, which is now being implemented around the country as a full-service technical assistance service.

Both of these approaches involve a hybrid of technical assistance and professional development. CTE teachers receive training in a pedagogic framework and the processes needed to enhance instruction on the mathematics or reading and writing tasks that occur naturally in their own curricula. CTE teachers are not asked to replace their curricula; instead, they are provided with the pedagogic framework and processes they need to enhance their existing CTE curricula. The overall goal of the technical assistance is two-fold: to build the capacity of state or local leadership to implement and sustain curriculum integration while concurrently providing high-quality, extended teacher professional development.

A full implementation of the Math-in-CTE or Literacy-in-CTE models of curriculum integration involves year-long work with a state or district leadership team. NRCCTE-trained facilitators provide

teachers with extended professional development and work directly with the site leadership team, apprentice-style, to build their capacity to lead and expand the model. The technical assistance is grounded in principles that emerged from the evidence-based research of the Math-in-CTE study and the Literacy-in-CTE study.

Systematic collection of evaluation data is integral to the NRCCTE’s technical assistance and professional development services. Data are continually collected from participating sites to ensure a satisfactory level of service to states, ascertain the activities that are most effective in meeting states’ needs, and inform future technical assistance and professional development activities. Evaluative processes and instruments are also utilized to ensure the fidelity of the implementations and to help leaders

The NRCCTE supports educators with professional development that helps them improve their practice, engage students, and improve their students’ academic and technical achievement outcomes.



maintain the core principles of the model. Literacy-in-CTE staff also use online weekly teaching reports to document teachers' use of literacy strategies and their perceived confidence in selecting and implementing appropriate strategies for each lesson.

Analysis of the evaluation data reveals overall satisfaction with technical assistance services and with teachers' interactions with NRCCTE facilitation staff. Teachers frequently comment on the effectiveness of the professional development and the impact it has on their teaching. Specifically, they mention the value of networking with other teachers, both within and among content and academic areas. Both CTE teachers and academic teachers comment that they recognize the value and challenges of each other's roles and curricula. They indicate that the opportunities the training provides to collaborate in the creation and refinement of lesson plans throughout the year are very valuable. Many considered increased student engagement to be an important outcome of math- and literacy-enhanced lessons.

TECHNICAL ASSISTANCE ACADEMY

Additional technical assistance is provided to states through the NRCCTE's annual Technical Assistance (TA) Academy. Managed by two of the NRCCTE's consortium partners, FHI 360 and NASDCTEc,

“ We are going to have to read in order to know what we're supposed to be doing...I think it's the backbone to any and every job out there. ”

—Literacy-in-CTE student participant

the purpose of the TA Academy is to help states with year-long technical assistance starting with summer workshops and following up through the rest of the year. Topics for the TA Academy are generally related to Perkins IV requirements that the NRCCTE, OVAE, and contacts with the field identify as of high concern to CTE stakeholders. In 2008-2009, the academy focused on non-traditional Perkins accountability indicators. The 2009-2010, the TA Academy focused on green economy-related POS. Eighteen

TECHNICAL ASSISTANCE UPDATE

Utah North Part of Statewide Curriculum Integration Plan



After a year of successful implementation, Utah is expanding the Math-in-CTE model to a regional format that spans the entire state. Three regions (North, South, and Salt Lake City) are all working with NRCCTE facilitators to enhance the math in the FACS curriculum. A number of teachers and administrators used their experience from the 2010-2011 implementation to serve as local facilitators.

Math educator Jennifer Tanner (at left) and FACS teacher Gail Ferrin work to complete their lesson plan for a large group presentation.
photo by NRCCTE

The Northern Utah regional summer professional development held in June focused on Foods I and II and Clothing I and II. FACS teachers learned the importance of recognizing and teaching embedded math concepts using correct mathematical terms and calculations; they also developed extended applications to assist students in bridging the gap between traditional classroom math and career-infused mathematics. Both FACS and math educators benefited from lesson development collaboration, as math teachers learned new ways to incorporate career-oriented math into their classroom experience for students.

NRCCTE Study Examines Return on Investment for CTE, Workforce Development Programs

CTE's role in connecting secondary education with workforce development has long been recognized, but current CTE evaluation systems have struggled to offer objective evidence to determine how CTE adds value to the U.S. economy. Return on investment (ROI) studies may help the field accomplish this task.

Conducting Return on Investment Analyses for Secondary and Postsecondary CTE: A Framework, a specially commissioned study, was written by Kevin M. Hollenbeck of the W. E. Upjohn Institute for Employment Research. This study extends Hollenbeck's recent work estimating the rate of return for workforce development programs, including secondary and postsecondary CTE, in Washington state.

In this study, Hollenbeck calculates ROI based on estimates of the net impact of CTE on individuals' labor market experiences and government income supports after participating in CTE or workforce development programs. The paper discusses his estimation approach and presents estimates for postsecondary and secondary CTE. Hollenbeck found that participants in CTE programs reaped substantial returns—positive earnings—with almost nil or negative costs for secondary CTE. At the postsecondary level, any associated participation costs (tuition, foregone earnings) were more than outweighed, even over the short term, by the economic payoffs of participating in CTE.

The NRCCTE's study meets four key preconditions for an optimal ROI study: (a) a uniformly global set of information—a comprehensive database that uses a common, standardized set of definitions and measures; (b) a well-developed, integrated conceptual framework; (c) superior managerial oversight and sound administrative knowledge; and (d) highly connected data systems and advanced institutional research expertise. However, many states and districts that could benefit from ROI analyses find it difficult to meet all four of these preconditions.



Although studies like Hollenbeck's represent the best way to conduct ROI analyses, for many in CTE, implementing such techniques is difficult, particularly when budgets are tight. The CTE field often has difficulty meeting the preconditions for rigorous ROI and needs to find less stringent alternatives without sacrificing rigor. "The NRCCTE is exploring such alternatives with its ROI guidebook and ongoing work with national CTE datasets," said NRCCTE Deputy Director Pradeep Kotamraju.

The NRCCTE's ROI guidebook, to be launched in 2012, will outline the different approaches and methodologies to measuring ROI for CTE. NRCCTE staff are also exploring the ways in which national CTE data—from the U.S. Department of Education, Office of Vocational and Adult Education, and the National Center for Educational Statistics (NCES) sample surveys—can be used to develop appropriate methodologies for calculating ROI for CTE.

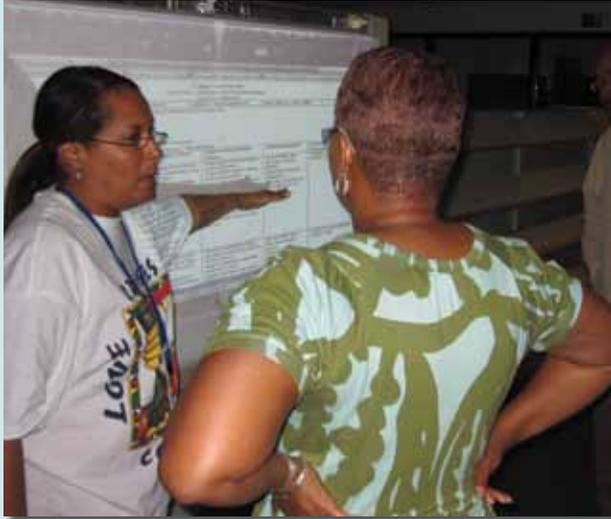
Industry-recognized credentials and certificates, like those that can be earned in ASE-certified automotive programs, are an important component of POS.

photo by ACTE



Download *Conducting Return on Investment Analyses for Secondary and Postsecondary CTE: A Framework* at <http://bit.ly/gBaAnn>.

CTE Educators Using a Data-Driven Improvement Model: The Chicago Public Schools Experience



NRCCTE technical assistance participants discuss strategies with fellow teachers in intensive, hands-on training sessions.

photo by NRCCTE

In an NRCCTE-sponsored research study, NOCTI investigators John Foster, Sandy Pritz, Patricia Kelley, and Carol Hodes explored how educators are prepared to use assessment data to improve programs and target individual and group instructional needs in the secondary-level CTE classroom. Findings from their research on professional development and educator use of assessment data were used to create the NRCCTE's newest professional development offering, CTEDDI, which helps secondary CTE teachers and administrators learn how to effectively interpret assessment data and use it to make instructional improvements in the classroom.

Launched in 2011-2012, CTEDDI provides educators in participating states with the professional development intended to increase their knowledge and skills in the use and interpretation of assessment data for the purpose of making instructional improvements. The professional development is delivered by facilitators who also serve as coaches for the educators for applying their initial training at their school sites.

Chicago Public Schools (CPS) was among the sites that participated in the pilot of the CTEDDI model. In a podcast conversation that can be heard at <http://bit.ly/teSlyu>, Catherine Imperatore of ACTE was joined by John Foster of NOCTI, Frances Beaman, one of CTEDDI's national facilitators, and several representatives from Chicago Public Schools,

including Johnnie Turner, manager of CTE Program Administration, Willie Chatman, culinary teacher at North-Grand High School, and Aarti Dhupelia, CPS CTE Director.

Frances Beaman described how CPS teachers responded in end-of-year evaluations and what lessons they took away from the process:

"The teachers need to see clearly how this process is going to benefit them in their classroom. They need to be able to see the link between the student deficiencies and the classroom instruction. And that has to be central to the whole discussion that we have."

"One of the things—and this was in several instances, I thought this was interesting—several of the instructors found that their students were not necessarily proficient in the theory part of the instruction, but they could demonstrate the skills. So, by having that information early, they were able to go back and beef up the theory part of their instruction. And when we did the posttest on students, students obviously did much better on those assessments."

States interested in signing up to participate in the CTEDDI professional development should email nrccte@louisville.edu for more details.



states submitted proposals requesting assistance and five were selected to receive assistance in conceptualizing and developing green POS models:

- Ohio – energy/biotech/sustainable environment systems
- New Jersey – sustainable design, construction, and energy
- Oregon – sustainable building
- Georgia – energy systems
- Illinois – architecture and construction and manufacturing

In 2010-2011, staff from FHI 360 continued to provide technical assistance to these five states to help them build replicable models for bringing their green-focused POS to scale. This work focused on finalizing their models; developing curriculum, technical assistance, and program plans; designing implementation plans; and assisting local education agencies and postsecondary institutions in implementing their models.

PROFESSIONAL DEVELOPMENT FOR CTE EDUCATORS

CTEDDI. The NRCCTE's professional development projects are conducted by NOCTI and SREB. In previous years of the current NRCCTE, NOCTI developed a model—CTEDDI (Career and Technical Educators Using Data-Driven Improvements)—to train CTE administrators and teachers in how to use the results from technical assessments to guide program improvement. The project began with surveys and case studies of teachers and administrators to determine if they use data, what types of training they had previously received, and the kind of additional training they would like to receive. NOCTI staff used the results from these data and an extensive review of relevant literature to develop materials and processes to improve the ability of teachers and administrators to use assessment data. NOCTI then refined the resulting model, CTEDDI, and has begun offering training in its implementation to states nationwide. To increase awareness of the availability of CTEDDI, project staff have offered several extended pre-conference workshops at various national meetings of CTE educators. CTEDDI is also being promoted through presentations at professional meetings, journal articles, podcasts, and web seminars.

Alternative Certification Induction Model.

To meet the needs of new CTE teachers who are pursuing alternative routes to certification, staff from



Hospitality and Tourism represents one of the fastest growing sectors of the job market, including for those with only a high school diploma.
photo by ACTE

SREB, sponsored by the NRCCTE, developed and are testing an induction model that combines facilitated workshops with ongoing support. The goal of the model is to assist individuals who enter teaching without formal teacher preparation to learn the skills necessary to plan, deliver, and assess instruction. Workshops focus on four professional development

modules that cover instructional planning, instructional strategies, assessment, and classroom management. These modules were developed and field tested and revised across 2008-2010. In 2010-2011, SREB conducted a pilot test of this professional development system in preparation for a national full-scale launch.

NRCCTE Launches First National Programs of Study Institute



To assist states in addressing barriers to the implementation of federally mandated Programs of Study (POS), NRCCTE launched its first National POS Institute, a six-month program of research-based technical assistance intended to support states in improving the quality of CTE instruction provided to secondary and postsecondary students.

Oklahoma, Minnesota, Kentucky, and Guam were selected through a competitive process to participate in the technical assistance, which commenced with a two-day meeting on February 6-7, 2012 in Louisville. Later national-level convenings of the National POS Institute will be held at the 2012 ACTE National Policy Seminar, March 5-7, and the 2012 Career

Clusters Institute, June 18-20, held by the NRCCTE's consortium partner, NASDCTEc.

"POS are a hallmark of the current Perkins legislation. Although the language about them is new to Perkins IV, the essential concepts have been part of CTE improvement efforts for decades. They contain elements of Tech Prep, School-to-Work, Career Education, and other efforts. Despite this, states continue to be challenged by their implementation."

—James R. Stone III

At the Louisville meeting, the NRCCTE brought together evidence-based resources, including researchers from its portfolio of research studies on POS and other experts, to address the

implementation barriers identified by the states.

The Center's goal is to help states apply the results of research to the improvement of their programs. Over the remainder of the project, state teams will receive additional assistance from a national NRCCTE facilitator and an in-state facilitator.

The Institute follows in the footsteps of the NRCCTE's evidence-based Math-in-CTE curriculum integration model, which began as a research study and launched nationally as a program of technical assistance and professional development in 2006. Nearly 30 states and large districts have since implemented the model.

What is College and Career Ready?

From a conversation with James R. Stone III



“College and career ready”

is a new term, relatively speaking, that has permeated the conversation about education reform. The Obama Administration uses the phrase in conversations regarding the Elementary and Secondary Education Act. The idea is that one of the roles or purposes of the public education system is to prepare young people to be ready for careers and for college—it’s not *or* but *and*.

At a conceptual level, there’s little disagreement about that, although I have some colleagues who would argue that it’s all about college. That aside, the idea that we need to do both—that is, prepare students for college and careers—has permeated the national conversation about education.

A question and a challenge come in deciding what college and career ready really means. If we say “college ready,” there are some advocacy organizations that have a very clear definition of that, and it’s heavily focused on more academics, with students taking three or four years of mathematics, three or four years of science, and so on.

What we at the NRCCTE have found, and others, including the Association for Career and Technical Education, have found, is that to be career ready requires other domains of knowledge and skill. There are many academic skills necessary to be successful in a workplace. I like to think of those skills as the occupational expression of academics. It isn’t enough to know that the Pythagorean

theorem is $a^2 + b^2 = c^2$. If you’re building something that has a roof, you need to know how to apply that theorem to calculate the slope or pitch of the roof. That’s actually the foundation of the NRCCTE’s curriculum integration work.

Clearly, young people need to master certain kinds of academic skills to be successful in the workplace. But I think a question arises of which academic skills are necessary. Is, for example, a regimen of four years of mathematics needed for most of the jobs we expect to be available over the next decade? There’s debate about that.

So there’s the occupational expression of academics, but two other areas are perhaps even more critical—these are called either “employability skills” or “workforce readiness skills,” but they’re the kinds of skills that were discussed in the SCANS report from the late 1980s. Such skills are being talked about now in conversations about 21st-century skills. They’re all of those skills that make someone a successful adult in a work setting.

The third set of skills are those that are technical in nature. Indeed, if someone wishes to obtain a job as a welder, that person needs to know how to weld. But there’s a lot of debate about how much training in those kinds of skills should be available and when.

There are shared variants across these sets of skills. If you imagine them as three circles, they overlap in something like a Venn diagram. To be career ready and college ready, you really need to address all three domains.

RECOMMENDED FURTHER READINGS

Association for Career and Technical Education. (2010, April). *What Is Career Ready?* Alexandria, VA: Association for Career and Technical Education.

Carnevale, A. P., Smith, N., & Strohl, J. (2010, June). *Help Wanted: Projections of Jobs and Education Requirements through 2018*. Washington, DC: Center on Education and the Workforce, Georgetown University.

Organisation for Economic Co-Operation and Development. (2010, August). *Learning for Jobs: OECD Reviews of Vocational Education and Training*. Paris, France: OECD.

Symonds, W. C., Schwartz, R. B., & Ferguson, R. (2011, February). *Pathways to Prosperity: Meeting the Challenge of Preparing Young Americans for the 21st Century*. Cambridge, MA: Pathways to Prosperity Project, Harvard Graduate School of Education.

In thinking about this, it's important to keep in mind that a substantial percentage of young people who start ninth grade will never set foot on a college campus. We can assume that our nation's many reform efforts are going to change that. Indeed, there's been some upward ratcheting of the number of young people who start and even finish college, but the fact of the matter is that for an awful lot of young people, high school is the last publicly funded opportunity we have to prepare them to become successful adults. Paul Barton from ETS has made this observation.

There will be some young people who will, in a very linear progression, move from high school to college, then on to graduate school or professional school, and then into those kinds of occupations that require such high levels of education. Others will finish high school, bounce around from job to job, attend the local community college, and take advantage of the workforce development available to them there. But there will be still a substantial number of young people for whom neither of these two trajectories is in their future, for whatever reason.

As we think about college and career readiness, we need to make sure that all young people can be success-

ful—not just those who master the system and move on to postsecondary education as we currently envision it, even though that is a useful goal.

Returning to the question of what kinds of skills are necessary for college, I would argue that academic skills are largely dependent on the major. If someone is moving into a math-intensive major like engineering or medicine, there's clearly a need for a lot of mathematics during his or her high school preparation. If someone is moving on to a liberal arts major, generally the requirements in most of those majors would be a single math course—and that math is often defined as mathematical thinking, not necessarily algebra, statistics, or calculus. So there are different academic course-taking trajectories that should be considered.

The challenge comes, I believe, in trying to craft multiple pathways in high school for young people so that all of them can be successful. The notion that every young person follows the same path through high school and then branches out into other directions after high school may not be the best model. I base this in part on two recent reports that are critical to understanding how we might want to think about education. One is *Pathways to Prosperity*, recently released by the Harvard Graduate School of Education, and the other is *Learning for Jobs*, published by the Organisation for Economic Cooperation and Development. Both of these reports look at the ways in which young people move from high school into adulthood. Both provide valuable lessons, and among those lessons are that there are many different kinds of opportunities for young people based on their abilities, interests, and passions, not just their test scores, and that there is no single pathway that all young people pursue in making a successful transition into adulthood.

What does college and career ready mean to you?
Email us at nrccte@louisville.edu.

The transition to successful adulthood can take many directions—that's the crux of the conversation and the debate. The challenge lies in figuring out what that means and then providing all of those different opportunities for young people.

Programs of study have the power to engage students by connecting academic learning with hands-on, work-based learning experiences.
photo by ACTE

MAKING AN Impact

The Influence
of the NRCCTE



RESEARCH

The research agenda of the current NRCCTE builds on work conducted under the previous NRCCTE and maintains its focus on the engagement, achievement, and transition of CTE students in secondary and postsecondary programs. Critically, the NRCCTE's 2007-2012 research portfolio has included studies of POS, curriculum integration, professional development of CTE teachers, and postsecondary CTE. With the increased importance of data and accountability under Perkins IV, the NRCCTE has also undertaken studies of statewide data systems and technical skills assessments.

Such work is having a demonstrable impact on the field. The results of research studies conducted by the current and previous NRCCTE are actively being cited in peer-reviewed journals specializing in educational policy, research methods, postsecondary studies, technology, and CTE, among others.

Since 2001, NRCCTE-affiliated researchers have produced 77 NRCCTE reports and published 42 related articles in peer-reviewed journals. As a measure of the NRCCTE's impact, NRCCTE reports and related peer-reviewed journal articles have been cited nearly 1,263 times, according to a recent Google Scholar search.

Another measure of impact is the extent to which NRCCTE research is recognized by the larger education community, the federal government, and state and regional governments and organizations. Many states and state agencies have cited NRCCTE work or promoted their involvement with the NRCCTE on their websites, in training documents, and in newsletters, among other sources. Just a few examples include:

- Alaska: Alaska's Educational Resource Center references the NRCCTE as a resource.
- Illinois: The Illinois Office of Educational Services cited the NRCCTE's green POS-focused TA Academy.
- Montana: Montana LINCS (Literacy Information Communication System) promoted the NRCCTE's "Career Side of College and Career Ready" symposium and webinar.
- North Carolina: The North Carolina Career Resource Network lists the NRCCTE as an educational resource.
- Pennsylvania: The Pennsylvania Association of Career and Technical Administrators highlighted the NRCCTE's study of technical skill attainment and post-program occupational and educational outcomes of Pennsylvania CTE graduates.
- Tennessee: The Tennessee Department of

RESEARCH IN FOCUS

NRCCTE cited in *The New York Times*

NRCCTE Director Jim Stone was cited in an article by Motoko Rich published on July 9, 2011, "Tough Calculus as Technical Schools Face Deep Cuts." The article, the first in a proposed series examining CTE training at high schools, community colleges, businesses, and student organizations in the United States, addressed the impact the govern-

ment's proposed cuts to CTE funding might have on education and workforce training. The article cited the NRCCTE's scientifically based Math-in-CTE research study and the Harvard Graduate School of Education's *Pathways to Prosperity* report. Read the article (subscription may be required) at <http://nyti.ms/tooLwz>.

Education's website, *Career and Technical Education: A 2020 Vision*, cites NRCCTE research.

- Texas: NRCCTE work was cited in the *Texas Education Agency's Career and Technical Education CTE Blog*.
- Virginia: NRCCTE work was cited under research on STEM Education.
- Wisconsin: The Department of Public Instruction cited NRCCTE research on CT-SOs in its *Local CTE Coordinator Workshop Guidebook*.

Beyond the NRCCTE's influence on state and local policy and practice, the research-based work of the NRCCTE has influenced significant national and international policy organizations. For example:

- The Paris-based Organisation for Economic Cooperation and Development cited the Math-in-CTE model in its *Learning for Jobs* report
- The National Governors Association cited the curriculum integration work of the NRCCTE in its Issue Brief, *Retooling Career Technical Education*.
- The Institute for a Competitive Workforce, an affiliate of the U.S. Chamber of Commerce cited the work of the NRCCTE in its report, *The Skills Imperative*.
- The American Youth Policy Forum cited the NRCCTE's curriculum integration work in a Forum Brief and in its publication *Supporting High Quality Career and Technical Education Through Federal and State Policy*.
- The Education Commission of the States (ECS) cited the NRCCTE's Math-in-CTE

technical assistance project in its Career/ Technical Education State Notes and eConnection.

NRCCTE work is frequently cited in education and general readership publications such as the *New York Times*, the *Chronicle of Higher Education*, *Education Week*, *Education Daily*, *Investor's Business Daily*, *Techniques* magazine, and many local and national newspapers.

Math-in-CTE Technical Assistance Impact: 2006-2011

Participating States	▶ Alaska, Arizona, Colorado, Iowa, Indiana, Kansas, Kentucky, Maine, Minnesota, Mississippi, Missouri, Montana, New Hampshire, New Jersey, North Carolina, North Dakota, Oregon, Utah
Participating Large City School Districts	▶ Arlington, VA; Arlington, TX; Fort Worth, TX; Detroit, MI; Miami-Dade, FL; Minneapolis, MN; Washington, DC
Participating State Leaders	▶ 187
Participating CTE Teachers	▶ 649
Participating Math Teachers	▶ 602
Estimated CTE Students Directly Impacted*	▶ 17,000+

MATH-IN-CTE

Nowhere has the NRCCTE been seen as adding more value to the CTE community than in the continuation of the Math-in-CTE project. Multiple states, local school districts, and other educational entities have implemented or are currently implementing the Math-in-CTE curriculum integration model that was researched, pilot-tested, and constructed as a technical assistance and professional development activity under the previous Center. Math-in-CTE has been nationally and internationally recognized as a scientifically based curriculum integration model.

Featured in the Organisation for Economic Cooperation and Development's Learning for Jobs Report: Published in 2010, the OECD's *Learning for Jobs* is intended to help nations improve the linkages between CTE and the labor market. The report singled out the Math-in-CTE research study in a review of curriculum integration approaches.

Endorsement by the State of Washington. In the 2008 Washington state legislative session, a bill (SB-6377) was introduced and passed that included a provision to: "allocate grant funds to school districts to increase the integration of and rigor of academic instruction in career and technical courses. Grant recipients are encouraged to use grant funds to support teams of academic and technical teachers using a research-based professional development model

* A conservative estimate based on the number of CTE teachers directly involved in technical assistance. This figure does not include impact on students in math classes taught by math-teacher partners or impact on CTE students in classes taught by CTE teachers who did not participate in the technical assistance process. Additionally, 285 individuals, including state administrators, CTE teachers, and math teachers from 29 states have participated in Math-in-CTE Jump Start training sessions.

Rudy Morosoff (at right) is the math teacher partner for welding teacher Jonathan Theberge.
photo by NRCCTE



supported by the National Research Center for Career and Technical Education.” As a result of this legislation, Washington has used the Math-in-CTE model to coordinate and promote integrated science, technology, engineering and mathematics (STEM) across the state.

The Denver Public School system has adapted the Math-in-CTE model starting as far back as 2004. After taking part in the initial Math-in-CTE research study, Denver schools have continued to implement the model with 18 different CTE/Math teacher teams in 7 program areas in 10 different schools.

Since 2006, the Oregon Department of Education (ODE) has supported specific professional development on elevating the level of mathematics instruction in CTE. The Math-in-CTE project, which started as a single workshop provided in collaboration with Lane Education Service District, now helps CTE teachers from other school districts partner with math teachers to identify the math that naturally occurs in CTE courses.

In the 2005-2006 school year, Michigan embarked on a pilot project to create Career Cluster Resource Guides for each of the 16 career clusters. These resource guides were designed to be available on the internet and provide teachers and administrators with sample lessons integrating academics into the CTE programs. The Math-in-CTE model’s seven-element lesson plan was adopted by the state.

NATIONAL AND STATE ORGANIZATIONS

NRCCTE staff regularly meet with, provide expert testimony to, and maintain ongoing liaison relationships with national and state-level organizations with a shared interest in CTE. Such organizations include:

- Alliance for Excellent Education
- American Youth Policy Forum (AYPF)
- Council of Chief State School Officers (CCSSO)
- Education Resources Information Center (ERIC)
- Georgetown University Center on Education and the Workforce
- Illinois Board of Education: Taking High School Reform to Scale in Illinois
- Innovative Technology Experiences for Students and Teachers (ITEST) Learning Resource Center

Citations of NRCCTE Publications: 2001-2012 - Google Scholar

	Number of Publications	Number of Citations
Peer Reviewed Journal Articles	42	474
NRCCTE-Produced Reports	77	789
Total	119	1,263

- National Alliance for Partnerships in Equity (NAPE)
- National Assessment of Career and Technical Education (NACTE)
- National Center for Education Statistics (NCES) CTE Statistics Technical Review Panel
- National Governors Association (NGA)
- National Science Foundation (NSF)
- New York State Education Department - CTE workgroup

Over the past five years of its funding, NRCCTE staff have also participated in dozens of major conferences, meetings, forums, and symposia, including presentations or appearances at ACTE, the ACTE National Policy Seminar, the American Association of Community Colleges (AACC), the American Educational Research Association (AERA), the American School Counselors Association (ASCA), the Career Clusters Institute, the Council of Chief State School Officers (CCSSO), HSTW, the National Association for Career and Technical Education Information (NACTEI), NASDCTEc, the National Association of Secondary School Principals (NASSP), the National Career Academy Coalition (NCAC), the National Career Pathways Network (NCPN), the National Center for Education Statistics (NCES), the National Conference of State Legislatures (NCSL), the National Council on Workforce Education (NCWE), the NGA, the University Council for Workforce and Human Resource Education (UCWHRE), and numerous other state- and regional-level meetings.

Improving Secondary Career and Technical Education through Professional Development: Alternative Certification and Use of Technical Assessment Data

Secondary CTE is a field in transition. It is moving from a primary focus on preparing students for entry-level employment to preparing them for continuing education and training as well as employment. The rapid pace of change in technology and the global economy has created a demand for workers who are able to learn and adapt, and CTE must prepare its students to meet these demands. Greater emphasis is being placed on assessment to improve accountability and to verify that students have acquired the skills to undertake these challenges. These higher expectations come at a time when more students are taking CTE courses and fewer CTE teachers are graduating from teacher education programs. The field has responded by recruiting more teachers from

business and industry, but those who enter teaching in this way typically have had little pedagogical training. Neither these teachers nor many of their colleagues who enter the profession through a traditional teacher education program are prepared to use technical skills assessment data to help students gain higher levels of competence.

The NRCCTE is responding to these developments with a number of projects, some of which are being conducted by its own staff and others that are being directed by institutions that are partners in the NRCCTE consortium. Two of the projects are developing professional development models for improving the skills of secondary CTE teachers. SREB is developing and testing an induction model for alternatively certified teachers; that is, those who have not

completed a traditional teacher education program. NOCTI is applying its expertise to a professional development model designed to improve the ability of secondary-level CTE teachers and administrators to interpret data from technical skill assessments to improve instruction.

The projects discussed in this report respond to core needs of the field, but the professional development challenge is far more extensive than what these projects alone address. Secondary CTE serves a large segment of secondary students and must contribute to their academic as well as technical learning. Most CTE teachers will need considerable professional development to broaden their teaching skills and to learn to use data for program improvement. The professional development they receive should be directly related to the courses they teach and of sufficient intensity and duration to influence their instruction. In the present economic climate, providing adequate time for effective professional development may be the most difficult challenge of all.



Programs in Law, Public Safety, Corrections, and Security are perennially popular with students.
photo by ACTE

WEBSITE AND MEDIA

The core of our dissemination efforts is the NRCCTE's website, <http://www.nrccte.org>, which presents topic-specific content related to the NRCCTE's work, priority areas, and issues central to the field. The website is organized around topics of interest to the field and provides access to past re-

search and information on currently funded projects. Publications available on the site include:

Research Reports (1991-2012): 188

Podcasts and Videos (2000-2012): 259, many in multiple formats with accompanying transcripts and, when available, supplemental PowerPoints and other materials.



Visitors to the NRCCTE's booth at ACTE 2011 receive advice about how the Center's evidence-based research can impact their professional practice.

Photo by Lauren Schultz, ACTE



Research Snapshots: 25. One research snapshot, *Community College Access and Affordability*, was the recipient of a 2009 APEX Award for Publication Excellence.

Videos. During the 2009-2012 period, many of the NRCCTE's videos focused on POS. Videos produced included an early POS roundtable and four field-based videos on the experiences of various sites implementing POS (Omaha, NE; Brevard County, FL; Orangeburg-Calhoun Technical College, Orangeburg, SC; and Los Angeles Trade-Tech College). Research-focused panel discussions have also generated videos, including two panels featuring NRCCTE researchers involved in studies of POS and a panel discussion of the career side of college and career ready that was taped at ACTE's 2011 National Policy Seminar. Other videos include introductory remarks from the 2011 NRCCTE-OVAE Spring Colloquium made by the Assistant Secretary for OVAE, Brenda Dann-Messier, and NRCCTE Director James R. Stone, III; plus two short videos featuring Dr. Stone discussing the mission and activities of the NRCCTE and the meaning of college and career ready. All can be found on www.nrccte.org.

In 2012, the NRCCTE will launch a new series of videos on Math-in-CTE, the most popular and asked-about of the NRCCTE's research-based products. Sites in Arlington, VA, Detroit, MI, and Portland, OR, were filmed with the goal of capturing the essence of the Math-in-CTE model from the perspective of teachers, administrators, and student participants. Additionally, the NRCCTE filmed complete curriculum integration lessons that will be launched as separate videos for the benefit of those educators who inquire about what Math-in-CTE

looks like in action.

Math-in-CTE has also inspired educators to produce their own videos about the process with no involvement or encouragement from the NRCCTE. We know of four teacher-, district-, or field-created videos about Math-in-CTE that were produced in Utah, Oregon, Missouri, and Kentucky:

- Utah: <http://bit.ly/qZLyqB>
- Lane Educational Service District, Oregon: <http://bit.ly/qRZOS7>
- Missouri: <http://bit.ly/pLRc9X>
- Kentucky: <http://bit.ly/rd27jH>

Social Media. The NRCCTE uses social media platforms, including Facebook and Twitter, as a means of increasing engagement with targeted communities. The NRCCTE is currently followed by many individuals interested in CTE, including educators and administrators, and also by such organizations as the Community College Research Center, Career Safe, the AACC, Jobs for the Future, the National Academy Foundation (NAF), Cisco, the CTE Council, USAToday Education, the Office of Community College Research and Leadership at the University of Illinois, national and regional CTSO chapters (e.g., HOSA and DECA), and a number of state CTE departments.



SINCE LAUNCHING IN THE WINTER OF 2008, THE NRCCTE WEBSITE HAS RECEIVED:

- 395,024 page views
- 113,478 visits from 77,965 unique visitors
- Visitors from 174 countries/territories

Podcasts. The NRCCTE's *Career-Technical Education Research News* podcast series, available on the NRCCTE's website, at its companion Podbean.com site (<http://nrccte.podbean.com>), and from the iTunes storefront, summarizes NRCCTE research, provides site visit updates from field-based studies, and captures current trends in CTE. A module for delivering Podbean podcast content is featured on the NRCCTE's website. To date, our Podbean channel has had more than 29,000 channel visits, over 14,000 feed hits, and more than 22,000 visitors.

May 8, 2009

To whom it may concern:

My name is C.J. Anderson and I am in Mr. Shamburg's afternoon Carpentry class. I've always had trouble with Math and my grades usually showed that. When I came into the Carpentry program I was worried about learning the Math part. This year I feel like I've overcome that worry at least in Carpentry. I have more faith in what I'm doing because of the Math I've learned in Carpentry. Recently I had to take my ACTs at my home high school. When it came to the Math part of the test I started to get nervous. After starting the test I realized I knew the answers to the questions because of what I've learned in my Carpentry class. I felt it was important to let you know how well I did on the Math part due to the Math I've learned through Mr. Shamburg's Carpentry class. It's so much easier to learn Math when you apply it to the real world and not just studying out of a textbook. Thank you for your time.

C.J. Anderson

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354 CEHD Louisville, KY 40292

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However, the contents do not necessarily represent the positions or policies of the Office of Vocational and Adult Education or the U.S. Department of Education and you should not assume endorsement by the Federal Government.

Discrimination:

Title VI of the Civil Rights Act of 1964 states: "No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance." Title IX of the Education Amendment of 1972 states: "No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving federal financial assistance." Therefore, the National Research Center for Career and Technical Education project, like every program or activity receiving financial assistance from the U.S. Department of Education, must be operated in compliance with these laws.



We know CTE.

The National Research Center for Career and Technical Education is the primary agent for generating scientifically based knowledge, disseminating that knowledge, and providing professional development and technical assistance to states to improve career and technical education in the United States. The **NRCCTE works to improve** the engagement, achievement, and transition of high school and postsecondary CTE students through technical assistance to states, professional development for CTE practitioners, and dissemination of knowledge derived from Center work and other sources of quality research.

The NRCCTE's research, dissemination, professional development, and technical assistance projects address:

- Programs of Study linking high school to postsecondary CTE
- Integrating rigorous academics into CTE (with a special focus on Math, Science, and Literacy)
- Increasing graduation rates
- Professional development for career-technical educators
- Dual and concurrent enrollment
- Assessment and accountability
- Making high schools matter
- The role of CTE in preparing the green workforce
- The role of CTE in preparing students for high-demand, high-wage, middle- and high-skill occupations

For more on the center and its projects, visit www.nrccte.org or e-mail us at nrccte@louisville.edu.
Connect with us on Facebook and Twitter @NRCCTE



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NRC CTE

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