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BUILDING EFFECTIVE DATA STRATEGIES IN CAREER AND TECHNICAL EDUCATION

Career and technical education (CTE) programs (programs that teach students specific workplace skills aligned with the labor market) may track data for lots of different reasons: to comply with funding requirements, to manage their services and continually improve, to measure their progress toward their goals, and to evaluate whether they are making a difference for students. When used intelligently, data can be powerful. Data can help a program refine its model, pinpoint successes, and communicate lessons with funders and stakeholders.

Yet if data are so important, why don't more programs have successful data strategies?

Perhaps the reason is that there have been few guides available to help programs develop those strategies, even as CTE programs have received more attention and grown considerably in recent years. To fill that void, MDRC conducted a scan of leading CTE programs, starting with the projects affiliated with its [Center for Effective CTE](#). MDRC research staff members and partners were interviewed about the challenges and opportunities data provide. MDRC also reached out to innovative leaders, consultants, and organizations in secondary, postsecondary, and workforce CTE — the three main areas of the field — to discuss their data strategies and the challenges they have faced.

This brief presents highlights from those conversations. It further outlines four basic steps programs can take to strengthen their own CTE data-collection and measurement activities and develop robust — and manageable — data strategies. Because so few CTE programs have been subject to rigorous evaluation,¹ many of the recommendations in this brief are based on the interviews outlined above, and supplemented by MDRC's work with CTE programs to strengthen their design and implementation.

¹ Rachel Rosen, Mary Visher, and Katie Beal, "Career and Technical Education: Current Policy, Prominent Programs, and Evidence," working paper (New York: MDRC, 2018).

BACKGROUND

The dearth of successful data strategies in CTE programs can be seen as related to the breadth of approaches that CTE programs employ — and the diversity of problems they are attempting to solve. As a result, all CTE programs looking to use data better can benefit from first answering two basic questions: What problem does the program address? And how does it do so? Answering these questions will help the program determine what data to collect to show whether it is meeting its goals. When MDRC works with programs, it encourages them to begin answering the questions by developing or refining a theory of change. A theory of change is a model that breaks down programs into essential components and mechanisms theorized to contribute to positive outcomes.

Programs can use the theory-of-change framework to define what metrics will help them understand the activities and mediators (that is, the mechanisms of change) assumed to produce the desired outcomes (see Figure 1). They can then begin collecting data to answer questions about those outcomes. Not all outcomes will lend themselves to easy measurement, but the exercise of outlining outcomes can ensure that the data collection and analysis are focused on the most important components.

Of course, once a program has determined what metrics will answer its questions it must collect the relevant data, and doing so can present challenges. One of these challenges is that a CTE program may wish to measure outcomes that require data from multiple institutions or systems. For example, a high school CTE program may feature a work-based learning component such as an internship and also offer classes that count for college credit. To measure outcomes, that program might need to collect data from

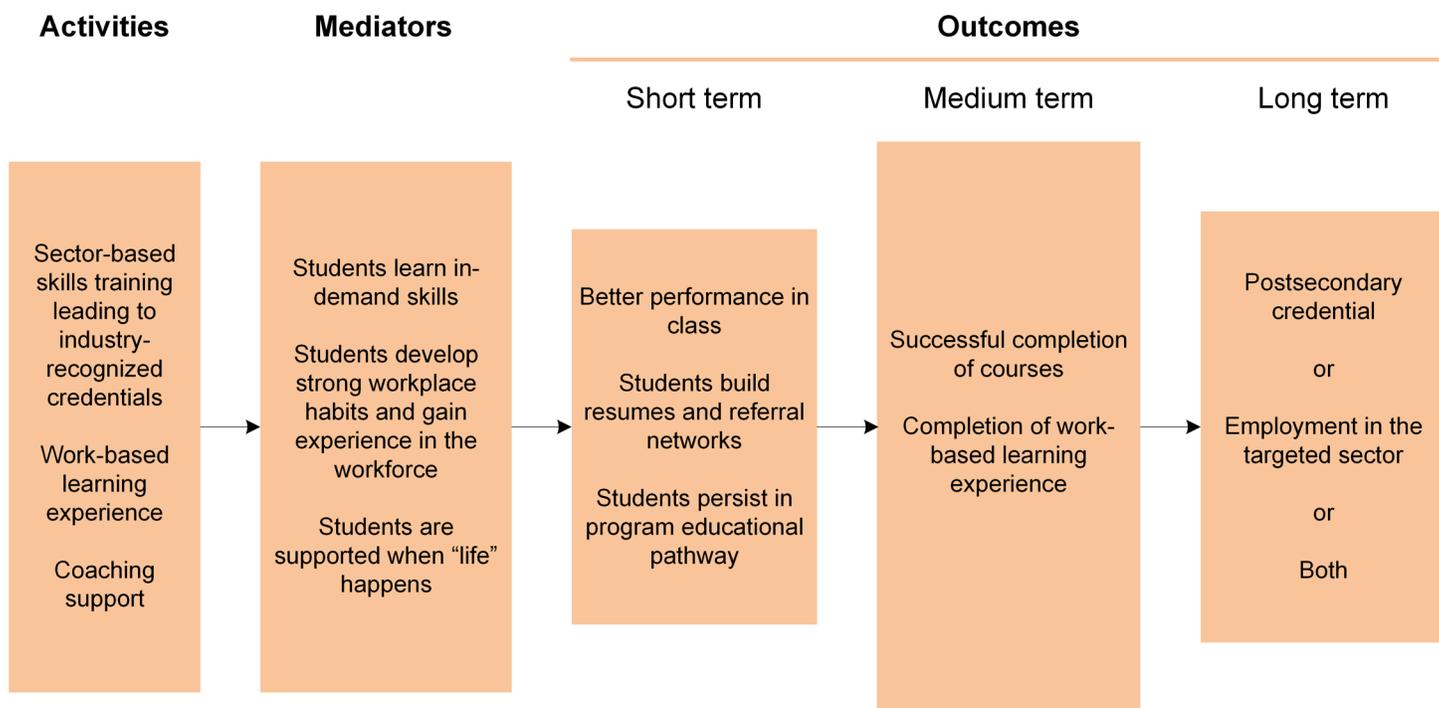
secondary, postsecondary, and workforce data systems. Take another example: A workforce CTE program for adults may offer training toward a credential with the aim of increasing participants' employment and earnings in the long term. To measure outcomes, that program would need to track the credentials participants earned from multiple certifying bodies, and would also need to obtain employment data on participants after they left the program, probably over months or years.

Moreover, what defines many CTE programs is that they take an unconventional approach to education and to workforce preparation. Traditional data systems that focus on things like high school completion, postsecondary degree attainment, or program participation are not typically set up to provide the variety of data CTE programs need. Data on work-based learning participation, nontechnical skills acquisition, and the attainment of nondegree credentials such as certificates, certifications, or licenses can prove challenging to collect in an educational system not set up for tracking them.²

To avert some of the challenges outlined in this paper, interviewees recommended hiring a data-strategy staff member early on. A person in this role can focus from the start on acquiring and analyzing data, devoting the time it takes to establish priority research questions, manage data collection and acquisition (by, for example,

² Nontechnical skills include those such as communication and teamwork. The terminology for nontechnical skills varies widely; related skills are described variously as employability skills, twenty-first-century skills, soft skills, job-readiness skills, career-ready competencies, noncognitive skills, essential skills, and workplace-readiness skills. Each term has its own distinguishing nuances. This brief uses the term “nontechnical skills” to encompass those skills that are essential to workplace experiences across industries.

Figure 1
Sample Theory of Change



developing data-sharing agreements or overseeing survey efforts), set up long-term data-collection systems and processes, and devise plans for analyzing the numbers. Of course, a data strategist alone cannot change an organization’s priorities; for that the organization needs the investment of both leaders and the front-line staff members who must enter the data.

METRICS RELEVANT TO CTE: REALITIES AND WORK-AROUNDS

Among the myriad activities and outcomes that programs track, a handful of components stand out as being both typical of CTE programs and challenging to monitor. Chief among them are work-based learning experiences, nontechnical

skills acquisition, and credential attainment. This section summarizes challenges of, innovations in, and approaches to measuring each.

Work-Based Learning Experiences

While work-based learning experiences are integral to many CTE programs, their definitions and standards span a broad spectrum of activities. Work-based learning can include internships, apprenticeships, mentoring, long-term volunteer placements, job-shadowing opportunities, and more.³ This variability creates questions

3 Jessica Giffin, GeMar Neloms, Amanda Mitchell, and David Blumenthal, *Work-Based Learning Definitions: Themes from States and National Organizations* (Washington, DC: American

of both dosage (how much of a work-based learning experience a participant gets) and quality. For example, how do program operators compare the value, intensity, and goals of a visit to a local business with the value, intensity, and goals of a yearlong paid internship?

While it may take rigorous research to determine the value of a work-based learning experience, a program can nonetheless establish a measurable target for itself and then develop a strategy to collect data that will reveal whether it has met that target. Here, developing or revisiting a program's theory of change is an important first step. What level of exposure or type of experience is posited to produce the intended outcomes? The answer — and the related outcomes that the program deems important to track — will depend on the program and the context in which it operates. Once a program can clarify the purpose and function of a work-based learning experience, it will be in a better position to develop internal standards and consistent definitions, including standards for what “counts” as work-based learning and what aspects of an experience are most likely to yield the intended outcome.

Though there is enormous variation in the field of work-based learning, the programs that responded to MDRC's questions for this brief are using many preexisting pieces of software and other tools. For example, a matching platform like LaunchPath, which connects individuals with

local experiences, may prove useful in answering questions of access such as: “Are participants of different races and genders being matched equitably?” To follow participation in work-based learning experiences, one CTE program has been using ImBlaze, an online portal and app that allows students and employers to connect for local internship opportunities, enter hours worked, and report information.⁴ Regardless of how a program collects data on work-based learning experiences, it should prespecify its measurement targets and limit tracking and data collection to those that are most important.

Nontechnical Competencies and Skills

Increasingly, employers are seeking to hire people who can demonstrate they have learned nontechnical skills from work-based learning experiences. Measuring those skills can be just as thorny as tracking the experiences. The “nontechnical skills” employers may value range from broad designations like communication and problem solving to more discrete competencies like stress tolerance or persistence in striving toward goals. And although apparently similar nontechnical skills can be relevant to diverse contexts and situations, it is difficult to understand and measure an individual's skill acquisition independent of context. For example, is peer communication in a welding shop a materially different skill from communicating with patients in a health care setting?

First, programs must determine whether and *why* to track nontechnical skills. Here again,

Institutes for Research, 2018). As an example of the extent of variation in definitions, 28 state education agencies have adopted formal definitions for work-based learning and 14 have adopted informal definitions; the remaining states have no definitions in place. Variations range from requirements that work-based learning experiences be paid, to references to employability or professional skills, to specifications that the work-based learning experiences connect to classroom learning.

4 In a handful of regions, schools, districts, and programs are also using ImBlaze to share information on work-based learning experiences in an effort to avoid counterproductive competition for the same opportunities.

developing and refining a concise theory of change can help programs decide whether to collect data on nontechnical skills, and to what end. Refining a theory of change and the rationale for collecting data will help programs determine which skills to track and how. For example, is the goal in collecting data to measure nontechnical skill acquisition for the program's own processes of continual improvement? Or is it to help teachers steer instruction, or so that students can communicate their skills more effectively to potential employers?

Relatedly, it is not always easy to figure out *what* nontechnical skills to track. There are many nontechnical skills programs could aim to improve, but they may initially do well to focus their data efforts on only a limited number.

Once an organization identifies the skills aligned with an intervention's intended outcomes, it must then determine *how* to measure those skills. The field has been grappling with this issue and some within it are attempting to standardize measures. The Regional Educational Laboratory of the Northeast and Islands has compiled a review of instruments that measure collaboration, perseverance, or self-regulated learning among secondary school students.⁵ In the postsecondary space, the Education Design Lab's BadgedToHire project, housed in three community colleges, is aimed at developing and expanding online microcredentialing assessments for hiring and employment. The New World

5 Joshua Cox, Brandon Foster, and David Bamat, "A Review of Instruments for Measuring Social and Emotional Learning Skills Among Secondary School Students," REL 2020-010 (Washington, DC: U.S. Department of Education, Institute for Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Northeast and Islands, 2019).

All CTE programs looking to use data better can benefit from first answering two basic questions: What problem does the program address? And how does it do so?

of Work has undertaken a similar effort in which students in high school and college can choose from 10 twenty-first-century skills and associated lessons, and online assessments of those skills are linked to digital badges that express their competencies. And separately, the ACT's WorkKeys assessments bundle individual skills based on employers' likely needs (for example, "graphic literacy" and "business writing"), thus supporting employer-to-program relationship building. These types of standardized assessments may be particularly useful for reporting to stakeholders on the skills students gain, or if a CTE program's mission makes it important to compare skills acquired across large groups.

In some contexts, programs may prefer to review skills qualitatively. Many schools and districts have recently embraced performance-based learning through "capstones," or performance-based assessments in which participants must undertake authentic tasks that mirror work responsibilities in those fields.⁶ Such approaches seek to honor the complexity of learning. In addition, many platforms, such as MHA Labs, assess the growth of nontechnical skills through employer performance reviews, surveys, and structured sessions for comments and suggestions. However, these qualitative approaches may not be used as readily

6 National Center for Innovation in Education, "Mapping Shifts in Teaching and Learning Supported by Performance Assessments" (website: www.leadingwithlearning.org/performance-assessment-map, 2018).

to track program growth or make comparisons among students, employers, or organizations.

Credential Attainment

For programs that aim to help participants attain postsecondary credentials, it can be especially vexing to measure outcomes related to those credentials. For one thing, programs must determine which outcomes they can measure and are grounded in existing research. While an estimated 27 percent of adults in the United States have nondegree credentials (including certifications, licenses, and other postsecondary certificates that are not formal college degrees),⁷ not all credentials are created equal.⁸ There is promising evidence that some nondegree credentials can lead to better wages, but those improvements are distributed unevenly across demographics, industries, and credentialing institutions.⁹ In other words, just because a

credential exists does not necessarily mean it has value. Still, in order to address questions of quality and value, programs first have to be able to keep track of what credentials their participants are earning and from where.¹⁰

On a systematic level, a few organizations are aiming to address the challenge of comparing the value of different credentials. Credential Engine is building a cloud-based registry to collect and connect information on all credentials in one publicly available catalog that would allow others (policymakers, states, credential issuers, researchers, etc.) to analyze the data and begin to make those comparisons related to quality.¹¹ Connecting Credentials, a coalition of 121 education and workforce cosponsors, has also sought to start a dialogue about transparency and the coordination of credentials. The coalition's work includes a framework for making "apples-to-apples" comparisons of different credentials.¹²

Despite these efforts, there are still areas where data about credentials are lacking. For example, no state has developed methods for tracking all types of nondegree credentials, nor is there a systematic federal data-collection effort for nondegree credentials.¹³ In fact only about half of states

7 Stephanie Cronen, Meghan McQuiggan, Emily Isenberg, and Sarah Grady, *Adult Training and Education: Results from the National Household Education Surveys Program of 2016* (Washington, DC: Institute for Education Sciences, National Center for Education Statistics, 2018).

8 Sandy Baum, *Higher Education Earnings Premium: Value, Variation, and Trends Connecting Credentials* (Washington, DC: The Urban Institute, 2014).

9 Matthew D. Baird, Robert Bozick, and Melanie A. Zaber, "Beyond Traditional Academic Degrees: The Labor Market Returns to Occupational Credentials," working paper (Santa Monica, CA: RAND Corporation, 2019); Mina Dadgar and Madeline Joy Weiss, "Labor Market Returns to Sub-Baccalaureate Credentials: How Much Does a Community College Degree or Certificate Pay?" CCRC Working Paper No. 45 (New York: Community College Research Center, 2012); David J. Deming, Noam Yuchtman, Amira Abulafi, Claudia Goldin, and Lawrence F. Katz, "The Value of Postsecondary Credentials in the Labor Market: An

Experimental Study" (*American Economic Review* 106, 3: 778-806, 2016).

10 Cronen, McQuiggan, Isenberg, and Grady (2018); ExcelinEd and Burning Glass Technologies, *Report 1: A National Landscape of High School Student Credential Attainment Compared to Workforce Demand* (Tallahassee, FL: ExcelinEd, 2019).

11 Credential Engine, "About Us – Credential Engine" (website: <https://credentialengine.org/about>, 2018).

12 Connecting Credentials, "Connecting Credentials Framework" (website: <http://connectingcredentials.org/framework>, 2016).

13 Roberta Hyland, "Industry-Based Credentials Are

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collect quantitative data on credential attainment, and most of those rely on data that schools or districts report themselves.¹⁴ As a consequence, if CTE programs want to track whether participants attain nondegree credentials, often they must reach out to those participants after they graduate, and doing so presents its own difficulties.

While the field grapples with these systematic challenges, schools and programs can take concrete steps to keep tabs on credential attainment. CTE programs with partners or multiple locations can establish common data systems (using software like Salesforce, homegrown management information systems, or even systems of spreadsheets) to make it easier for those partners or locations to merge and aggregate data. Programs that rely on individual participants to report the credentials they attain can use survey platforms like SurveyMonkey, Qualtrics, or Google Forms to begin collecting that information quickly and inexpensively.

BUILDING A DATA STRATEGY

Both new CTE programs and mature programs looking to revisit their strategies need to establish clear plans for collecting and analyzing data. What follows is a series of steps a CTE program might take to that end. The recommendations in these steps are drawn from the interviews conducted during this scan and from MDRC's experience supporting programs as they develop data processes.

Part of the Education Pathway," *Clearinghouse Today* (blog), National Student Clearinghouse (website: <https://studentclearinghouse.org/nscblog/industry-based-credentials-are-part-of-the-education-pathway>, 2016); Jenna Leventoff, *Measuring Non-Degree Credential Attainment* (Washington, DC: National Skills Coalition, 2018).

¹⁴ ExcelinEd and Burning Glass Technologies (2019).

Steps for Effective Data Collection and Analysis

- 1 Conduct a needs assessment and outline a theory of change.** What issues in the community is the program trying to remedy? What problem does it aim to address? Delineating how its model is meant to bring about change can help a program not only identify the effects it is trying to achieve but also predict how program activities should lead to the anticipated outcomes. These predictions help programs understand which activities are important to measure.
- 2 Define priority research questions and important outcomes.** What does the program want to know or understand better in the short, medium, and long term? What is the intended effect of participating in the program? Answering questions like these means a CTE program can limit its data collection to top-priority areas. It can focus its time and effort on answering a few major questions, rather than collecting data on everything feasible and then struggling to focus its analysis. This recommendation may seem obvious, but when faced with expansive data sets, it can take a concerted effort to determine where to focus one's often limited time and energy.

With more clarity about research questions, a CTE program can identify which outcomes it must measure and what data it needs. When it is not feasible to collect data or the data will take a long time to obtain, interim and proxy outcomes can be a useful work-around. That is, are there shorter-term outcomes such as attendance that

can point toward longer-term payoffs like completion? Other interim outcomes to note will depend on the program's goals, but examples may include perceptions and attitudes toward the program, academic improvement, or pay increases.

In establishing an analysis plan, a program should return to its theory of change often, to ensure that the analysis is firmly grounded in the most important elements of the program.

- 3 Set up data-collection processes.** With important outcomes firmly established, a program can consider building a system to house data. While “data systems” can sound daunting, they can be as simple as spreadsheets or as creative as building on existing software. Interviewees reported that creating a new system can be easier (and more efficient in the long run) than retrofitting an older system to meet newer data needs.

Programs can also reduce the amount of work staff members must put into collecting and tracking data by taking advantage of administrative data housed externally, in school districts, at community colleges, in statewide or national databases like the National Student Clearinghouse, or elsewhere.¹⁵ The accessibility of these data can vary widely, so programs may consider engaging a skilled technical-assistance provider or third party to navigate the sometimes confusing world of data collection and data-sharing agreements; the help may be particularly valuable when it comes to state systems, which may have detailed privacy regulations.

¹⁵ Administrative data are those collected primarily for the management of programs and public services.

- 4 Iterate, adapt, and update.** When in doubt, start somewhere. As one interviewee said, “You have to start to collect and report to be able to figure out where there are inconsistencies and gaps.” Be sure to share reports and analyses, even if they do contain inconsistencies or gaps, with staff members at all levels; seeing those reports can bring data entry to life and illuminate what is in it for teachers, employer partners, and staff members whose data you depend on — why it is worth their investment in time and energy. Ultimately, whatever dashboards, systems, or tools programs use to collect data, those systems should allow practitioners to access the data when they want. Practitioners can then, for example, track the hours students work week by week, or the percentage of them who attend a certain activity; such tracking can help programs respond to problems faster.

POLICY IMPLICATIONS

While CTE program administrators and staff members can take steps to strengthen their own data collection and analysis, some of the challenges outlined in this brief are likely to persist unless policies can be crafted to address them.

One of the more persistent challenges centers on definitions and standardization. For example, credentialing bodies and institutions have not yet coordinated enough with one another for programs, employers, and institutions to make sense of the value of credentials, particularly credentials at the postsecondary level that fall short of associate's degrees. Policy must address the needs of practitioners by establishing clear credentialing standards that allow for greater transparency and comparison. Similar problems exist when it comes to measuring work-based

Just because a credential exists does not necessarily mean it has value.

learning. If CTE programs could standardize definitions in these areas, they could have more fruitful discussions among themselves — and discover where they need to change.

Another policy challenge facing CTE programs relates to coordinating data: How are school districts, postsecondary institutions, and workforce programs communicating and sharing information and data? One promising step is that some organizations and coalitions have published tools and reports that attempt to bring into alignment the program-accountability indicators and teacher-quality provisions of the Workforce Innovation and Opportunity Act, Perkins V, and the Every Student Succeeds Act (federal legislation related to workforce training, career and technical education, and K-12 education respectively).¹⁶ While aligning these forms of data comes with challenges, it also presents compelling opportunities. Many CTE programs rely on partnerships and shared metrics. Establishing common metrics across partners leads to a richer understanding of what is happening in a program. Take the example of a hypothetical workforce CTE program: If that program only looks at employment and earnings outcomes, it may miss possible effects on postsecondary enrollment.

In the longer term, the field at large stands to gain a great deal from better metrics. Reliable measurement over a long span could allow the field to pinpoint the near-term measures that predict future workforce or college success.

More broadly, better data can help ensure CTE doesn't repeat the mistakes of its vocational-education past. Indeed, funders are increasingly paying attention to diversity, equity, and inclusion and asking for data on related outcomes. For example, Perkins V requires states to report data separated out according to several categories, including race and gender.¹⁷ CTE programs can get ahead of this trend by measuring equity-related outcomes, which can provide early opportunities to identify and address imbalances. Simply examining the outcomes of subgroups defined by race and ethnicity, gender, or socioeconomic status can reveal otherwise hidden inequities.

While policymakers catch up to the new realities of CTE, programs can still take steps to make sure they are coordinating data strategies that work for them, by adopting new tracking tools, by revisiting their theories of change, or simply by getting started.

16 Alliance for Excellent Education, the Center for American Progress, JFF, the Learning Policy Institute, the Linked Learning Alliance, NAF, and the National Center for the Improvement of Educational Assessment, Inc., *Innovating for Equity and Excellence: Recommendations to States for Implementing the Strengthening Career and Technical Education for the 21st Century Act (Perkins V)* (Washington, DC: Alliance for Excellent Education, 2019); Ellen Cushing, Susan Therriault, and David English, “Developing a College- and Career-Ready Workforce: An Analysis of ESSA, Perkins, and WIOA” (Washington, DC: American Institutes for Research, 2019).

17 Boris Granovskiy, *Reauthorization of the Perkins Act in the 115th Congress: The Strengthening Career and Technical Education for the 21st Century Act, R45446* (Washington, DC: Congressional Research Service, 2018).

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