



Beyond the Numbers

Design Principles for CTE Data Reporting

Data-driven decisionmaking has never been more important in education — particularly in Career Technical Education (CTE). COVID-19 (the coronavirus) has had widespread and unprecedented impacts on the educational system and economy.

To support access to high-quality education and prepare learners for economic success during COVID-19 and beyond, CTE leaders and other policymakers need access to valid, reliable data to improve the quality and availability of program offerings and ensure that the needs of each learner are met. In addition, learners and their families need accurate information about educational and employment opportunities to make decisions about education and training options, including the need for upskilling and reskilling driven by the pandemic. Likewise, employers need information on the local and regional supply of skilled workers and their credentials and competencies. All of these needs point to the importance of full and accurate reporting on CTE programs and the value of data that is meaningful — and accessible — to a wide variety of audiences.

At the same time, CTE leaders are working to implement the new Strengthening Career and Technical Education for the 21st Century Act (Perkins V), which includes a strong focus on sharing data with learners, families and other stakeholders as well as using data to improve programs and make decisions about funding priorities. To help address the challenge of reporting meaningful data, Advance CTE, with support from the Association for Career and Technical Education, convened a Shared Solutions Workgroup of national and state leaders to identify promising practices and develop recommendations to improve the sharing and use of CTE data with internal and external stakeholders under Perkins V. This paper can serve as a roadmap for state and local leaders as they develop and redesign public reporting mechanisms — including report

cards, fact sheets, infographics, Perkins accountability reports, dashboards and more — that not only meet the requirements of the law but also align with broader efforts for data-driven decisionmaking and meet the needs of end users.

Perkins V Reporting Requirements

While previous iterations of the Perkins legislation required local public reporting of CTE data, Perkins V builds on this foundation by requiring states to publicly report data as well. In addition, the law puts greater emphasis on evidence-based decisionmaking and provides more detailed reporting instructions, elevating the importance of making data available and accessible to help all stakeholders interpret and use it to inform action.

As in the past, under Perkins V, each state must report to the U.S. Department of Education the indicators of performance laid out in the law. In this federal reporting, states must disaggregate data by race/ethnicity, gender, migrant status (secondary only), and the special population groups outlined in Perkins V (a list that is expanded from Perkins IV). States now must also disaggregate federal data by the CTE program/program of study or Career Cluster® to drill down to more specific program-level performance. These federal reports must intentionally identify and quantify any gaps in performance between groups of learners. The secretary of education will then make this information available to the general public as well as to Congress in reports, including state-by-state comparisons.

**PERKINS V DEFINES
THE FOLLOWING
SPECIAL
POPULATIONS:¹**

- Individuals with disabilities;
- Individuals from economically disadvantaged families, including low-income youth and adults;
- Individuals preparing for non-traditional fields;
- Single parents, including single pregnant women;
- Out-of-workforce individuals;
- English learners;
- Individuals experiencing homelessness (as described in the McKinney-Vento Homeless Assistance Act);
- Youth who are in or have aged out of the foster care system; and
- Youth with a parent who is a member of the armed forces and on active duty (as defined in the United States Code).

In addition to the required federal reporting and national dissemination of CTE data by the U.S. Department of Education, Perkins V goes further than previous iterations of the law to require states to disseminate this information more broadly. States must publicly report the performance of all CTE students and subgroups of learners and make this information available “widely, including to students, parents, and educators; through a variety of formats, including electronically through the Internet; and in user-friendly formats and languages that are easily accessible, as determined by the eligible agency.”²

Similarly, Perkins V requires local grant recipients to report CTE performance data to the state and disseminate data to learners, families, practitioners and the public in a format that is “understandable and uniform” and “as practicable, provided in a language that students, parents and educators

can understand.”³ While these local requirements are similar to the expectations in Perkins IV, the language is more specific and focused on ensuring that all stakeholders have access to meaningful data.

Perkins V sets the minimum expectations for reporting CTE data, but states can and should go beyond the letter of the law and use this moment in time as a springboard to enhance the quality and availability of CTE data. Already, some states are identifying additional metrics and performance indicators that are not required by federal law but will be useful to practitioners and the public. Others are designing new, user-friendly dashboards and reports that equip key stakeholders to understand the data and take action. As states align their existing reporting to meet new expectations in Perkins V, they should seize the moment to produce tools and resources that will be useful to their key constituents for years to come.

**PRECONDITIONS
FOR SUCCESS**

States and local recipients must have a foundation of accurate, timely data collection from which to build data tools that will inform CTE stakeholders and support program quality. These preconditions for success include:

- Valid, reliable and complete data that is collected consistently;
- Data from the most recent timeframe appropriate for a particular indicator; and
- Data that can be disaggregated by all required learner groups and special populations, as well as by CTE program/program of study or Career Cluster.

Meeting this last precondition will be easiest if the state can collect learner-level data instead of aggregated data. Another important step toward meeting these preconditions for success and ensuring consistency across CTE data collection is developing data dictionaries and business rules that set parameters for collecting and reporting data.

In addition, state leaders should strive to align terminology, definitions and common measurement approaches across federal programs and with other state agencies. While the Perkins eligible agency alone cannot accomplish this alignment, cross-agency conversations can begin to move state data in a more consistent direction and go a long way toward creating more useful, easy-to-understand public reporting.

Design Principles for CTE Data Reporting

While states and local Perkins grant recipients have discretion in how to present their CTE data, Perkins V gives them the opportunity to make data more accessible, more user friendly and easier to interpret through a concerted effort to improve data reporting and dissemination tools. The following design principles can guide state leaders in disseminating data that is purposeful, visually compelling and understandable. Each principle includes a list of key questions to consider to help state leaders develop an action plan for creating impactful data tools and visualizations.

- 1. Clarify the Purposes for Sharing Data**
- 2. Make Data Easy to Find**
- 3. Make Data Visually Appealing**
- 4. Clearly and Consistently Label and Describe Data**
- 5. Make Data Accessible**
- 6. Disaggregate Data to Highlight Equity**
- 7. Provide Context to Add Meaning**
- 8. Enable Interactivity and Customization for Key Audiences**
- 9. Help Users Interpret Data and Take Action**

The principles are intended to help CTE leaders design public data reporting and dissemination tools that not only meet the specific requirements in Perkins V but also go beyond the minimum requirements. Going beyond the minimum can ensure that all relevant stakeholders have the information they need when they need it and that they can access and interpret it with ease. These principles can apply to a variety of informational and promotional tools; equity-focused resources; and local, state or federal required reporting.

1. Clarify the Purposes for Sharing Data

KEY QUESTIONS TO CONSIDER

What are your objectives for CTE data reporting and dissemination?

What other reporting and communications tools can supplement CTE data reporting?

How have you engaged relevant stakeholders in identifying the purposes of CTE data reporting and the appropriate reporting and communications tools?

To provide meaningful data that is accessible and useful, state leaders should clarify their purposes for sharing data and for each decision that is made in the presentation of data. Developing this clear purpose will require internal clarification about the state CTE agency's objectives, discussion with multiple stakeholders about their needs and goals for using data, and research into best practices for ensuring that the data is accessible to the intended audiences. Even the process of defining audiences and clarifying the purposes of CTE data can lead to more focused and actionable reporting.

For example, if a purpose for sharing data is to help learners and, when appropriate, their families make more informed choices about enrolling in CTE programs, then including program-level data and highlighting labor market outcomes in public reports is important. If the primary purpose is an aggregate evaluation of programs for the purposes of state policy or funding, other elements may be more important. Some potential purposes for data sharing include:

- ➔ Providing accountability/public transparency;
- ➔ Informing practitioners;
- ➔ Supporting program improvement;
- ➔ Informing policy and budget decisions;
- ➔ Providing career guidance;
- ➔ Highlighting equity issues;
- ➔ Evaluating program effectiveness;
- ➔ Informing employers; and
- ➔ Spurring action among CTE advocates.

In many cases, public data reporting will need to serve multiple purposes, and documenting these purposes at the beginning of the design process will help to guide decisionmaking along the way. At the same time, states should consider the appropriate reporting tools for communicating data. For purposes of this report, data tools could include but are not limited to:

- ➔ High school or college report cards;
- ➔ Issue-specific reports, such as publications addressing equity or career readiness;
- ➔ Interactive dashboards;
- ➔ Perkins accountability reports;
- ➔ Fact sheets, infographics and brochures;
- ➔ Presentation slides;
- ➔ Spreadsheets;
- ➔ Videos;
- ➔ Data stories; or
- ➔ Social media and e-newsletters.

One single reporting and dissemination tool will likely not be able to meet all the data-related goals in a particular state. State leaders should consider using multiple reporting tools — in various formats — to communicate relevant information to different audiences and help meet the needs of every CTE stakeholder for meaningful data.

The Shared Solutions Workgroup's accompanying communications toolkit, [**Beyond the Numbers: A Toolkit for Communicating CTE Data**](#), can help states identify target audiences and the information in which those audiences are most interested. The toolkit also provides guidance, best practices and customizable tools to help state leaders design communications that integrate data visualizations, text and other elements to tell a story and encourage action from targeted audiences.

2. Make Data Easy to Find

KEY QUESTIONS TO CONSIDER

How easily can users find CTE data tools by navigating state CTE websites or through a Google search? Have you engaged stakeholders in user testing?

How clearly are CTE data tools labeled in website menus?

Are secondary and postsecondary CTE data available in the same place?

How well is CTE data integrated with other state data? If CTE is integrated into Every Student Succeeds Act (ESSA) report cards or postsecondary datasets, how easy is it for users to navigate from the state CTE website to these other reporting tools?

To ensure wide access to data, state leaders must make data tools easy to find on state CTE websites. Too often, current reporting is buried on website subpages, not clearly labeled in menus, or found in several different places. Data tools should be centralized on state CTE agency websites under a clear label such as "Data and Results" or "CTE Accountability Reports"

to help all stakeholders find them. Additionally, secondary and postsecondary CTE data should be available in the same place so that linkages can be made between the two.

In addition to creating an easy-to-find, centralized home for both secondary and postsecondary CTE data on state CTE websites, states should include CTE performance data within other state education data reporting and tools such as state ESSA report cards or state community and technical college reporting. If CTE data is incorporated into these other state data sources or available on other agencies' sites, links to these other data reports should be placed prominently on the CTE website.

States can harness website search engine optimization to ensure that materials are easy to find, followed by user testing to check whether the appropriate website comes up on the first or second page of a search engine query.⁴ Using clear language and key terms to describe reporting tools and locating them prominently on the state website can help boost their placement in search engine results. State leaders can also ask stakeholders to test website functionality to ensure that they can quickly and accurately locate data.

3. Make Data Visually Appealing

KEY QUESTIONS TO CONSIDER

What is an appropriate visualization based on your purpose and data type?

How can you use lines, shapes, color, text and layout to draw readers in and hold their attention?

How can you use lines, shapes, color, text and layout to direct readers' attention to key information?

How can you employ a style sheet to create consistent, user-friendly visualizations?

Have you engaged stakeholders in developing easy-to-read CTE visualizations?

To help users make sense of the numbers, CTE data should be presented in ways that are visually appealing and easy to follow. Many types of visualizations can make data more engaging and easier to read, including charts, heatmaps and pictograms. Examples of these visualizations are provided on pp. 6-7.

Regardless of the type of data visualization chosen, it should make strategic use of the basic elements of visual design, such as lines, shapes, color, text and layout.^{5,6} A successful visual design balances unifying design elements, such as the repetition of a particular font or color, with contrast and visual variety. Design experts Evergreen and Emery also recommend:

- ➔ Data that is ordered for the viewer (for instance, by frequency or time period);
- ➔ Horizontal labels positioned near the data;
- ➔ Hierarchical text size (larger titles and smaller labels);
- ➔ Text color that contrasts with the background color; and
- ➔ Sparingly use of borders, gridlines and axis lines.⁷

Employing basic design principles can signal to users how to read a data visualization and make data more accessible to the

general public. For example, coloring a data element green to indicate that a local recipient is meeting goals or has improved from the prior year can quickly show users where performance is strong. Similarly, directional arrows and checkmarks can quickly signal to readers where performance is increasing or decreasing or where objectives have and have not been met (these symbols also have the added value of being accessible for users with color blindness). State leaders can share drafts of visualizations with a selected subset of stakeholders to ensure that they are easy to read and interpret and that they are accessible for a variety of users (more information on accessibility can be found in Principle 5).

Statewide Proficiency Rates

English Language Arts			
2016-17	2017-18	2018-19	
62.1%	63.7%	64.6%	
Mathematics			
2016-17	2017-18	2018-19	
60.2%	60.4%	61.0%	
Science			
2016-17	2017-18	2018-19	
66.6%	70.0%	69.1%	

Source: *Ohio Department of Education*⁸

In addition, state CTE leaders can develop a style sheet that defines how all visualizations should look by specifying colors, fonts, label sizes and other visual elements so that data reporting and dissemination tools are consistent and well designed.⁹ This style sheet may apply just to CTE reporting or may be aligned across state education systems.

There are a nearly infinite number of data visualization types and many different ways to name and categorize these techniques. The examples below introduce several visualizations that state leaders can harness to represent CTE data and list the best uses for each type of visualization. These visualizations are possible with different types of software or levels of technical capacity and can be incorporated within a variety of reporting tools, including infographics, spreadsheets, webpages, dashboards, reports and presentation slides. The additional resources listed on p. 15 provide further information on data visualization types and the circumstances in which they are best used.

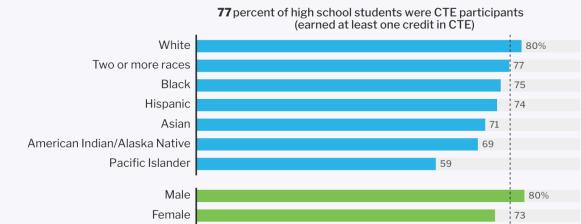
BAR CHARTS

- Compare groups or categories of data
- Use grouped or stacked bars for two or more categories



Source: RI DataHUB¹⁰

Percentage of high school students who were CTE participants



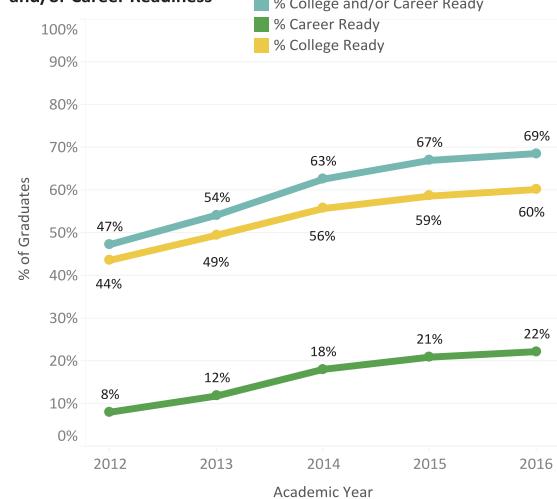
Source: U.S. Department of Education¹¹

LINE CHARTS

- Show change over time
- Combine with a bar chart to make a dual axis or combination chart

Source: KYSTATS¹²

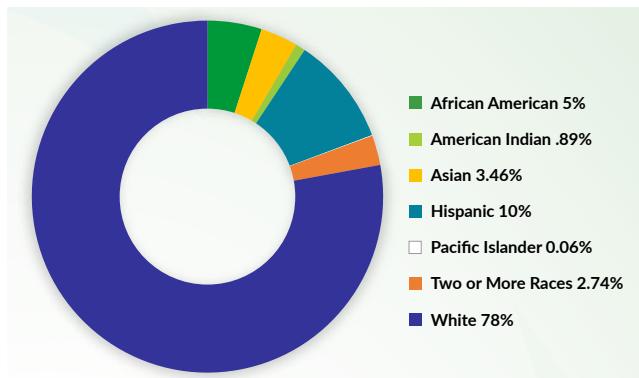
Five Year Trend for Kentucky High School Graduates' College and/or Career Readiness



PIE CHARTS

- Depict groups or categories of data as part of a whole (i.e., all categories add up to 100 percent)
- Work best with relatively simple datasets

Source: Wisconsin Department of Public Instruction¹³



PICTOGRAMS/UNIT CHARTS

- Use icons to represent quantities
- Work best with relatively simple datasets

Source: [Ohio Department of Education¹⁴](#)



TREEMAPS

- Show the relationship between parts of a whole
- Nest proportionally sized shapes within a larger shape

Source: [Data USA¹⁵](#)

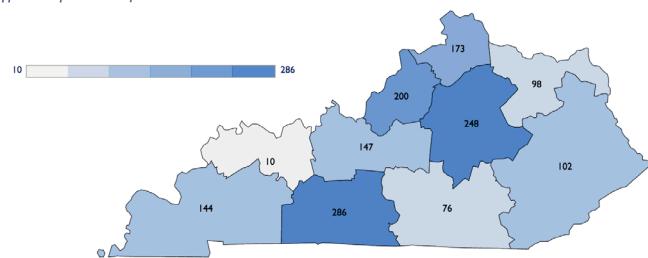


MAPS

- Show geographical data

Source: [KYSTATS¹⁶](#)

Apprenticeship Enrollments for Graduates in 2018

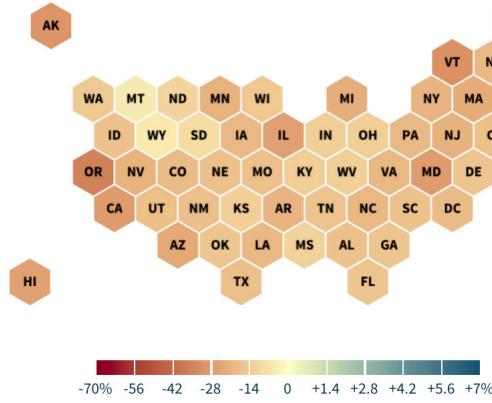


HEATMAPS

Percent Change in Employment

- Use color to define categories
- Can be applied to other visualization types, such as tables and maps

Source: [Opportunity Insights¹⁷](#)



4. Clearly and Consistently Label and Describe Data

KEY QUESTIONS TO CONSIDER

Do CTE data tools and visualizations incorporate clear labels?

Are CTE indicators and population groups, as well as data sources and limitations, defined in a way that makes sense to non-expert stakeholders? Have you engaged stakeholders to ensure that definitions are understandable to a lay audience?

How easily can expert users find additional technical information on indicators or data sources?

Are the same definitions used consistently across CTE reporting? How well aligned are CTE data definitions with other state reporting?

concentrators in career and technical education programs and programs of study that lead to non-traditional fields, i.e. female students in auto technology, male students in health occupations, etc.²⁰

Labels and descriptions can be tested with a variety of stakeholder audiences to ensure understanding. These user-friendly labels and definitions should be incorporated directly into data tools and visualizations, not buried on separate webpages. Links, popout boxes or “tooltips”—text that appears when a user’s mouse or touchpad hovers over a particular webpage element — that provide more technical definitions can provide additional details for an expert audience. (To ensure accessibility, links, popout boxes and tooltips should be screen-readable and viewable on mobile devices. See Principle 5 for more on accessibility.)

Data tools and visualizations should also clearly identify data sources to enhance understanding and provide transparency. This includes identifying the names of state data systems, time ranges for the data presented, and the presence of missing data or data that is suppressed to protect student privacy when a population group, program and/or institution includes a small number of learners, as described further in Principle 6. Shorter descriptions of data sources with less technical terminology can be integrated directly into the visualization, with links to more technical documentation for those users who need it.

Once clear and concise descriptions of indicators, population groups and data sources are developed, states should use them consistently across state and local CTE reporting. Using these descriptions and terminology consistently across other state data tools is helpful as well. Ideally, common data standards, data dictionaries and terminology for credentials and competencies across the state can support this consistency. If consistency cannot be accomplished, states should craft data reporting and dissemination tools with labels and descriptions that point out the differences. For example, if the graduation and extended-year graduation rates reported under Perkins V do not match the graduation rates presented in other state materials, owing to differences in federal and statutory reporting requirements, clear terminology to differentiate between the two is important. If one report includes a standard cohort graduation rate while another includes this cohort as well as learners who earn a graduate equivalency degree or certificate of completion, a more exact descriptor than “graduation rates” should be used in each report to address the nuances reflected.

One of the most important ways to help stakeholders understand CTE data is to provide a clearly organized and labeled resource with easy-to-understand descriptions. Each visualization should have a brief title. Web design research has found that readers, particularly English readers, start at the upper left, so that is a prime location for placing a short, descriptive title.¹⁸ Data elements within visualizations, such as rows and columns, should also have clear labels. If a report, dashboard or similar resource includes multiple visualizations, they should be organized so that readers are first introduced to high-level data before digging into specifics.¹⁹

As part of clearly labeling data, state leaders should strive to create user-friendly names and descriptions, avoiding jargon and “eduspeak” and minimizing acronyms. Avoiding this language can be particularly challenging when it comes to defining Perkins V indicators and special population groups. Oftentimes CTE leaders use the esoteric numbering system developed at the federal level to refer to specific Perkins indicators, such as “5S2” to refer to the secondary CTE program quality indicator that measures attainment of postsecondary credits or “4S1” to refer to non-traditional program enrollment. This terminology is likely to confuse a non-expert audience.

Instead, state CTE leaders should work with their communications teams or communications personnel in their agency to develop names and descriptions for indicators, population groups and other relevant CTE-specific data using commonly understood terms. For instance, the Wyoming Department of Education includes brief, descriptive examples in its 4S1 indicator definition to help users understand what is meant by non-traditional: “The percentage of CTE

5. Make Data Accessible

KEY QUESTIONS TO CONSIDER

- Which populations do you need to engage to test if CTE reporting and visualizations are accessible?
- Can your data tools and visualizations be read by screen readers through alternate text or similar tools?
- Is data reporting available in languages other than English? Were translations produced or verified by bilingual experts?
- Is CTE data available in multiple web- and print-based formats?
- How easily can data tools and visualizations be accessed and read on mobile devices?

To ensure that all users can read and understand CTE data, states should design “at the margins” by beginning with the needs of users who will have the most barriers to access. Stakeholder engagement at the outset, and user testing in later stages, can help to ensure accessibility. The end result of this design process will be accessible not only to users who are traditionally under-served but also to the general public.

Prioritizing accessibility includes making data tools that are easy to read and understand; available in multiple formats and languages; and usable by assistive devices, particularly screen readers. In addition to being best practice, accessibility may also be legally required: The Americans with Disabilities Act prohibits state and local government agencies from discriminating in access to services, programs and activities, which can be interpreted to include data reporting, and many states have passed specific laws requiring accessibility in state and local agency publications and websites.²¹

Design elements that reduce visual clutter, eliminate jargon and direct readers’ attention, as described further in Principles

3 and 4, can help all readers, particularly individuals with low vision and individuals for whom English is not their first language. Best practices include legible sans serif fonts, color contrast, and the use of dashed and dotted formatting in line graphs to help readers differentiate one trend line from another.^{22,23} In addition, software features such as alternate text that translate visualizations into words for screen readers can further support accessibility for stakeholders who are blind or have low vision.

State agencies should also translate data reports into languages other than English to ensure that non-English-speaking stakeholders can access information. This translation should involve more than plugging text into an online translator; rather, a bilingual speaker should generate or verify any translation to ensure its accuracy.

Beyond meeting the needs of people with disabilities and non-English speakers, providing the data in multiple formats can also expand access by enabling stakeholders to use this data in different contexts. These formats include reporting and dissemination tools that can be downloaded for additional analysis, printable PDFs that can be shared at in-person meetings, and online data sources designed with mobile devices in mind.

In addition to stakeholder engagement and usability testing, accessibility guidelines from trusted sources such as Section508.gov and software tools for testing accessibility can facilitate the design process. One quick and easy tool is the NoCoffee extension for Google Chrome, which simulates a variety of visual impairments. The additional resources listed on p. 15 provide further information on accessibility for different types of disabilities and accessibility testing tools.

6. Disaggregate Data to Highlight Equity

KEY QUESTIONS TO CONSIDER

- In public reporting, are you suppressing data when group sizes are smaller than allowed by your state and/or recommended by experts?
- Can CTE data be averaged over multiple years to protect student privacy and show trends?
- Can CTE data be disaggregated by more than one population category at a time?
- Can practitioners securely access disaggregated data?
- Do reporting and dissemination tools use asset-based language? Have you communicated with special and under-served groups about their preferences for language used in reporting?

Disaggregating, or separating, data to show trends for different learner groups can shine a light on opportunity gaps and help educators, policymakers and other stakeholders collaborate to close gaps and improve equity. It is imperative that state CTE leaders disaggregate data to better identify equity issues within CTE and share this data to build trust through transparency. Furthermore, Perkins V requires states and local grant recipients to disaggregate data by gender, race/ethnicity, migrant status (secondary only), and the special population groups identified on p. 2, as well as by program of study or Career Cluster, and to share data with the public on the CTE participation and performance of each of these learner groups.

When disaggregating data, state CTE leaders should take care to present this information in ways that protect student privacy. Many experts recommend publicly reporting state-level data only if the group includes at least 10 students, with data on smaller groups hidden.²⁴ Data scientists refer to group size in this context as “n-size,” and maintaining minimum n-sizes can ensure that performance data that could be linked to individual learners is not made public. It also prevents users from trying to draw conclusions from data based on very small sample sizes.

State leaders should consult state law or regulation, as well as district or institutional practices, to determine the appropriate n-sizes. One way to protect student privacy and help users derive more meaning from disaggregated data is to use data averaged over three years to create larger cohorts. This practice not only protects student data but also filters out year-to-year “noise” or minor discrepancies in data to better

illustrate longer term trends, without eliminating data on smaller population groups.

While disaggregation by single population categories can pinpoint important equity trends, state leaders can go deeper with multi-layered disaggregation. No one is represented by just one identity, so disaggregating by population group as well as program area, or by multiple population categories, can be meaningful. Educators, policymakers and other stakeholders can develop more specific, real-world strategies for closing gaps when considering data on Black female learners rather than data on Black learners and female learners as separate groups or when considering the participation of learners with disabilities in particular program areas rather than in CTE overall. However, this technique can also result in very small group sizes, as noted previously, and every combination may not be appropriate for public reporting.

Whichever approaches the state takes to disaggregation in public data tools, CTE practitioners should have access to learner-level data for the students they work with, without suppression of small numbers, to enable them to identify opportunity gaps and devise solutions. These data tools and visualizations should be housed on secure portals and require appropriate credentials to access. Disaggregated data, even when unavailable to the general public, can still be visualized using the design principles incorporated in this document to help practitioners — most of whom are not data scientists — to understand the data and use it as the basis for program evaluation and improvement.

Whether they are reporting data publicly or creating secure data tools for practitioners, state CTE leaders should avoid presenting data on the performance of different population groups and comparisons between groups in a way that “others” certain groups of students or centers learners of privilege as the baseline CTE participants. Using asset-based rather than deficit-based language in disaggregated or equity-related data can help address this issue. For example, using “opportunity gap” instead of “achievement gap” can illustrate that disparities result from systems-level factors rather than learners’ individual abilities.^{25,26} People-first language is also preferred by many stakeholders from special population groups — for instance, using “learners with autism” rather than “autistic learners” — although this preference is not universal. Communicating with stakeholders from particular learner groups about their data needs and language preferences can improve data tools.

7. Provide Context to Add Meaning

KEY QUESTIONS TO CONSIDER

How many years' worth of CTE data can you use to show trends over time?

What non-CTE data, such as labor market information or data from all learners in the state, is available that can help provide context for users?

How well does non-CTE data align to CTE data? How comparable are the student groups, time periods and definitions used? How can you communicate differences between CTE data and additional data that is used to provide context?

One or two years of CTE data, in isolation, may be insufficient to help stakeholders understand the impact of CTE on learners. State leaders can enrich data reporting by using multiple years of CTE data as well as other related datasets to add context and help make CTE data more meaningful. Several types of data can better demonstrate the impact of CTE by showing trends over time and provide useful comparisons:

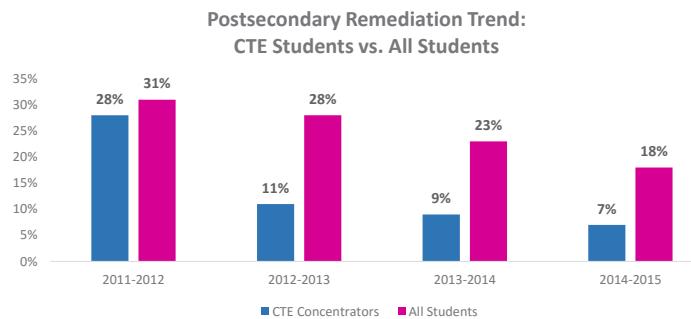
- ➔ Historical/longitudinal data;
- ➔ Performance of all learners in the state;
- ➔ Progress toward meeting statewide career readiness goals, such as a postsecondary credential attainment goal; and
- ➔ Labor market data.

For example, reporting the credential attainment rate of postsecondary CTE students on its own may not mean much to users, especially learners and families. Adding comparisons to the credential attainment rate for all learners or a state's

credential attainment goals, if available, can help to provide important context to CTE data.

Any additional data points used to provide context must be truly comparable to CTE data, or distinctions between CTE data and other data must be clearly noted. If definitions, populations, time periods or measurement approaches used in non-CTE data are too different, offering comparisons may skew interpretations and reduce the validity of reporting. For example, some labor market information applies to regions of a state that do not align with school districts or community college service areas, so caution should be taken when building comparisons.

The more comparable any additional datasets are, the more they can be integrated directly into visualizations with CTE data. For instance, a chart showing the graduation rates of CTE concentrators could include a column illustrating the graduation rate of all learners in the state, if the cohorts and time periods match. Data that is relatively, but not exactly,



comparable can be communicated through a separate visualization or additional text.

Source: Fleck Education in partnership with Thomas P. Miller & Associates²⁷

8. Enable Interactivity and Customization for Key Audiences

KEY QUESTIONS TO CONSIDER

What questions might different users ask about CTE data? Have you consulted with stakeholders about their most pressing questions and needs for customization?

What tools do you have that can enable users to customize data, such as dashboards or Excel spreadsheets with filtering? What technical, financial and data security considerations affect your use of these tools?

Where can users go to find more information and other data tools that answer their questions?

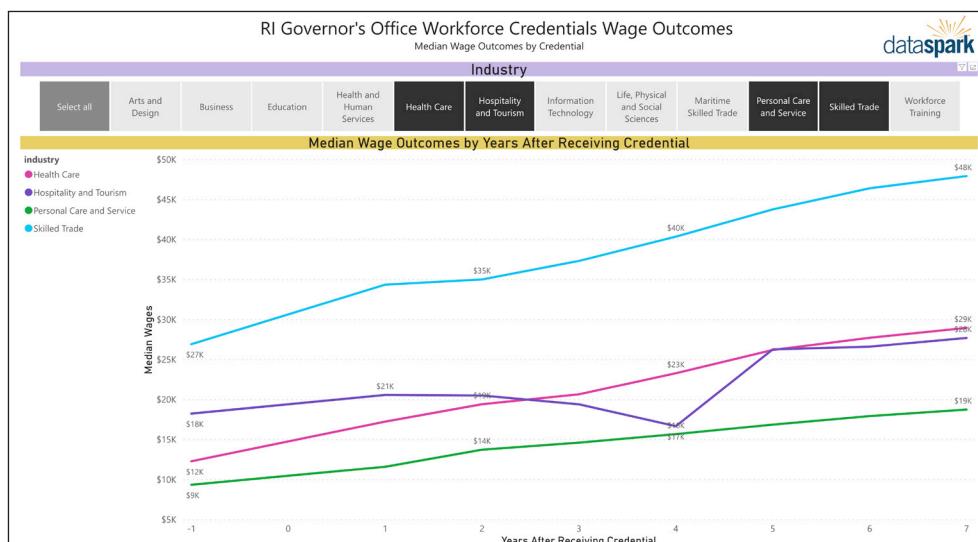
State CTE leaders can go beyond providing context to enabling users to customize or filter data for their particular needs, locations or interests. Incorporating interactive elements ensures that multiple audiences can find individual meaning in the data. Customization should be limited to filters that answer stakeholders' most frequent and important questions, as too many customization options can overwhelm the user.

Filtering by Career Cluster or program of study, as well as by local education agency or postsecondary institution, is a common customization option for CTE data. Allowing users to customize data locally serves a dual purpose of answering questions about CTE in their district or college and meeting local reporting requirements. It also helps to ensure consistency and validity in local reporting across the state. Additional filtering options may also be helpful, depending on the data being presented; state CTE leaders can engage stakeholders to determine which options for customization would be most impactful for different audiences.

Dynamic and interactive data dashboards — which states can develop using pivot tables and spreadsheets or through proprietary platforms such as Tableau, Microsoft Power BI and similar software — are a best practice in creating data reporting that is informative for multiple audiences. These tools frequently integrate filters, dropdown menus or checkboxes that enable users to customize reports by Perkins indicator, time period, population group, Career Cluster/program of study, or local school district/postsecondary institution. State CTE agencies do not need specific software to implement interactivity: Excel spreadsheets can be filtered to enable customization.

Whether the state chooses a platform like Tableau or Microsoft Power BI or uses Excel or a similar spreadsheet tool will depend on the desired audiences as well as technical and financial considerations. Cloud-based dashboards require an ongoing financial investment and restrict user access to source data, securing student information and facilitating public reporting. Filtered spreadsheets require less of an investment financially but frequently display source data within the spreadsheet itself, making these tools more suited for non-public purposes, such as when practitioners are analyzing data for program improvement.

Whatever customization strategies a state chooses, it is unlikely that one reporting and dissemination tool, even a fully interactive, dynamic tool, can represent the entire CTE ecosystem or meet the needs of every audience. When publicly reporting CTE data, states should clearly indicate where the user can get more information and provide links to other data tools or more in-depth information about CTE programs that will add meaning for different audiences.



9. Help Users Interpret Data and Take Action

KEY QUESTIONS TO CONSIDER

Does your CTE data reporting include takeaways that clearly articulate what a user is seeing in a particular visualization? Have you consulted stakeholders to ensure these takeaways make sense to a lay audience?

How well does your reporting explain to users the questions that can and cannot be answered by the data?

Are there appropriate actions that you can ask users to take after using data reporting and dissemination tools?

In addition to facilitating comparisons and customization, CTE leaders can help users interpret data and understand the value of CTE access and performance measures. Users have different levels of data fluency, and many of these design principles highlight the need to help all stakeholders — including learners and their families — better use CTE data reporting and understand its content. And while educators and some policymakers may see education statistics on a daily basis, even internal stakeholders will have different levels of expertise.

Data interpretation can help stakeholders, particularly those new to CTE, understand the value of CTE and make sense of performance indicators, including those required by Perkins V. Features such as captions, popout boxes or tooltips can not only be used for indicator definitions or technical documentation, as described in Principle 4, but also help explain the value of monitoring CTE program concentration or describe what stakeholders can learn from the new Perkins V secondary program quality indicators. This

interpretative assistance can be embedded within data tools and visualizations or offered through supplemental tools such as a brief webinar that provides additional framing and background information.

Interpretation can also include summarizing data into more understandable takeaways. For instance, a chart showing CTE concentrator populations disaggregated by gender could be accompanied by a caption, popout box or tooltip that distills the information in the chart into a single statement, such as “Female learners in [state name] were more likely to be CTE concentrators in the Health Sciences Career Cluster in the 2018-19 school year than male learners.” This element of the visualization can be static or, if using a customizable dashboard, based on selections made by the user.

More interpretative elements of data tools can also tell users which questions can — and cannot — be answered by the data and even guide users to take action. For instance, reporting tools based on student performance data can direct users to other sources for data on program quality and implementation. Reporting and dissemination tools can also link users to next steps such as visiting a CTE program or taking part in CTE Month.

While incorporating interpretation or action items into data reporting and dissemination can be powerful, CTE leaders should deploy these techniques cautiously. Interpretation should be specific and accurately reflect the data presented. Possible action items should be voluntary and non-partisan and should align with the state’s CTE goals. As with other design principles, stakeholder input can ensure that interpretations reflect a consensus on the meaning of the data and that action items are both meaningful and appropriate.

Conclusion

Available, accessible and easy-to-use data reporting and dissemination tools are critical to meeting the needs of CTE learners, families, practitioners, policymakers and the public. The design principles described in this report can help state leaders develop data tools that support different audiences to access information, make decisions and take action.

To learn more about how well-designed data reporting can fit within broader CTE data communications, access the Shared Solutions Workgroup's accompanying communications toolkit, **Beyond the Numbers: A Toolkit for Communicating CTE Data**.

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Additional Resources

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