Building a Data Infrastructure

Designing Postsecondary Data Systems to Inform Career Technical Education Improvement

Enterprise management information systems (EMIS) are used by postsecondary institutions to collect myriad information on institutional operations, including data that is relevant to Career Technical Education (CTE) programming. However, interoperability with state data systems is a persistent challenge that can be complicated and expensive to address.

State agency and postsecondary institutional administrators rely on EMIS to oversee CTE programming for a range of purposes. Such purposes include recording enrollment and grades, tracking learner and department finances, and assessing institutional and program performance. In addition, EMIS, also referred to as "data systems" throughout this brief, play a significant role in addressing CTE compliance monitoring mandated in state legislation and the federal Strengthening Career and Technical Education for the 21st Century Act (Perkins V).

Ensuring that EMIS operate as intended requires maintaining a modernized data infrastructure — one capable of collecting and storing vast amounts of longitudinal data from different sources and producing accurate, timely and reliable statistics. However, states often maintain their postsecondary CTE institutional data on standalone systems that are sequestered from their secondary and workforce information management systems.[1] Institutional EMIS are commonly supported by proprietary software, with Ellucian Banner the most ubiquitous. These systems enable institutions to capture a range of data on college operations, some of which is relevant to CTE programming, but they are often not interoperable with state data systems.

With support from ECMC Foundation, Advance CTE launched the Advancing Postsecondary CTE Data Quality Initiative (PDI) in 2020 and is working with a group of states to improve postsecondary CTE data quality and use. Alabama, Delaware, the District of Columbia, Florida and Oregon were selected to form a cohort focused on improving the quality of data collected on postsecondary CTE programs and using data to improve CTE program offerings, strengthen outcomes equitably across learner groups and special populations, and align the interests of learners with industry and programmatic needs.

Embracing the adage that form follows function, this brief focuses on the data collection and reporting expectations of postsecondary CTE policymakers and administrators, under the assumption that information needs should guide the management, use and acquisition of state data systems.

STRATEGY ONE
Understanding the Challenge

State postsecondary education agencies and institutions collect and use CTE data in a variety of ways, often using differing EMIS. These data systems enable institutions to capture a range of data on institutional operations that are relevant to CTE programming. While states may aspire to create comprehensive EMIS to collect data and administer CTE, numerous factors complicate system operation.[2] These factors include:

- *Siloed data systems* – Postsecondary technology systems maintained on differing operating systems may lack interoperability, complicating data aggregation and cross-agency matching of student records. States should consider how database elements can be migrated across systems, without losing accuracy or meaning, to assess the efficacy of student transitions.

- *Decentralized governance structures* – Having autonomous, locally controlled postsecondary system offices, which may include separate offices for state technical institutions, community colleges, and four-year colleges and universities, can mean EMIS are administered in differing ways. States should establish standardized business rules to ensure interoperability; while systems may diverge, the indicators used to assess CTE student outcomes should be consistent.

- *Lack of unique student identifiers (IDs)* – Student IDs that are sector specific limit the tracking of students across education levels and into the workforce. Assessing the benefits of a CTE program of study requires analysts to be able to uniquely identify CTE concentrators and completers prior to matriculation and quantify the impacts of their educational experiences.

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- *Limited staff capacity and institutional knowledge –* Fiscal constraints and a competitive job market complicate the hiring and retaining of qualified data programmers. High rates of turnover and staggering workloads can limit analysts' availability and knowledge of CTE's specialized reporting requirements. To compensate, states will need to create "turnkey" systems that produce accurate information regardless of analysts' tenure.

- *Legal constraints –* Student privacy laws can preclude the collection and sharing of some data elements, such as Social Security numbers, which are used to assess workforce outcomes. Information also must be securely transmitted to the cloud and from postsecondary providers. States will need to institutionalize cross-sector policies and data sharing agreements to ensure student confidentiality.

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System Requirements

Due to the unique characteristics of CTE programming, postsecondary EMIS should be designed with certain operational capabilities that allow states to collect and use data across systems. These requirements include:

- *Longitudinal educational data collection must be supported*

  A CTE program of study spans secondary and postsecondary education. Accordingly, state-level and institutional data systems should track individual learners as they progress through CTE programming, both within and across education levels. Systems also should incorporate trend data to allow for comparisons of learner cohorts over time.

  In the absence of a comprehensive statewide longitudinal data system (SLDS), state postsecondary agency administrators can establish data sharing memoranda of understanding with their state K-12 agency. These agreements should provide for the identification of high school CTE learners concentrating in and completing a CTE program of study, as well as the sharing of data elements used to assess whether learners entered college with the requisite skills for success and persisted in related studies. The state should oversee collaboration between K-12 and postsecondary education partners to ensure that CTE concentrator data can be linked.

- *Information on student transfer and employment outcomes must be accessible*

  Perkins V mandates that states report on learner placement in advanced postsecondary education and/or employment. Linking postsecondary education and workforce data is a high bar to clear: As of 2021, just 26 states operated systems capable of connecting data across their postsecondary and workforce sectors.[3]

To assess the contribution that postsecondary education makes to students, postsecondary data systems should support administrative record matching with four-year college and workforce data systems, as well as other stakeholder systems (e.g., human services, corrections). Agreements also can be established with national data warehouses, such as the National Student Clearinghouse, to assess CTE students' higher education outcomes (e.g., transfer from a community college to four-year college or university).

- *Data collection and analysis procedures must be documented and continuously validated*

Information is useful only if it is accurate. To ensure that postsecondary EMIS contain valid and reliable data, data governance rules should be put in place. Serving as a form of organizational memory, these rules help to ensure that database elements produce valid and reliable cross-sectional and historical trend data.

Policy manuals should detail when and how information is collected and how data elements are defined, stipulate how data elements are to be analyzed, and elaborate on data validation processes. States should also offer annual training to ensure that those tasked with collecting and entering data understand and follow system convention.

- *Data systems should produce user-friendly reports and visualizations*

States and institutions failing to achieve performance levels established by the state or locally face the potential loss of federal Perkins V funding. Improving outcomes requires engaging college administrators and faculty to undertake reforms, which begins with helping them to understand and own why change is needed. In addition to enabling the collection

CASE STUDY: Alabama non-credit to credit crosswalks

As part of its Strong Start, Strong Finish[4] initiative, Alabama is seeking to add 500,000 postsecondary degree, certificate or credential holders to its workforce by 2025. Recognizing that non-credit training programs can align to industry-recognized credentials, the state is exploring strategies to transform non-credit to credit programs through articulated on-ramps using competency-based education and credit for prior learning. To monitor its progress, the state is developing procedures for collecting and reporting data from non-credit programs. This work includes establishing consistent definitions of key terminology and business rules for identifying qualifying programming and compiling and analyzing data.

and analysis of data, state and postsecondary EMIS should be designed to output data displays in differing formats geared toward the ways people process information.

To motivate improvement, accountability data should be shared with stakeholders in formats (e.g., tables, figures, infographics) that translate complex data into actionable information. Data also should be disaggregated by gender, race/ethnicity and special population status, as well as by institutional department and CTE program of study. Institutions can use this information in the development of their Comprehensive Local Needs Assessment (CLNA), which Perkins V mandates be conducted on a biannual basis.

STRATEGY THREE
System Design: Delaware's EMIS Design Process

Delaware leveraged its involvement in the PDI to build cross-agency support for a statewide information system to monitor career pathways programming. The state's experience in creating a shared data system spanning the secondary, postsecondary and workforce sectors offers a model for how data can be used to support system-wide strategic planning. This information can contribute not only to informing colleges' Perkins V CLNA planning but also to strengthening learner transitions across education levels and with the workforce development system.

State administrators followed a five-stage process to strategically engage representatives from across the education and workforce sectors in identifying needs and reformulating EMIS to support interoperability. The process included:

Step 1: Create a shared mission

Participants established a set of common career development goals for youth and adults, with the recognition that agencies may assist the same individual at different times and for different purposes. While services may be discrete, members agreed that the summative effect is what matters.

Step 2: Define data use cases

State administrators identified non-negotiable reports required for federal and state agency purposes, the rationale for producing them and the data elements needed. They also identified and prioritized lists of desired information. The resulting use cases provided a starting point for creating a pool of data for education and workforce development purposes.

Step 3: Formalize data governance procedures

Data in Delaware is collected by different agencies using different procedures. Discussions focused on clarifying data collection and administrative processes and establishing ground rules on allowable uses. These conversations ensured that people understood what is included in agency data and reduced fears that information may be used in ways that is not intended.

Step 4: Conduct a gap analysis

Once state administrators established data needs, they identified missing elements and developed procedures for collecting them. Discussions included determining what prevented data from being collected (e.g., finances, staffing) and the steps that could be taken to overcome those obstacles.

Step 5: Prioritize and fund needs

As a concluding activity, task force members sought consensus around future priority needs. They reached an agreement on how state funds could be invested to build out system functionality and crafted a plan to stage the development work — addressing technology and interoperability — in subsequent years.

Key Takeaways

Learners concentrating in a CTE program of study should be prepared to enter the workforce or seamlessly transition into a postsecondary institution to earn a credential, certificate, associate degree or baccalaureate degree. Accordingly, postsecondary data systems should offer instructors and administrators comprehensive, cross-sector information that can be used to assess programmatic effectiveness and target improvement efforts.

The Career Readiness Metrics Framework developed by Advance CTE and Education Strategy Group offers metrics that should be considered for EMIS inclusion. Organized into seven categories spanning the education continuum (Table 1), these metrics can help ensure that college systems have critical data points needed to assess CTE program effectiveness.

Building data systems to support CTE programming begins with recognizing that postsecondary institutions play a critical role in career education. If CTE programs of study are to achieve their promise, then postsecondary data systems need to be designed with an interoperable, longitudinal focus. Systems must allow state and postsecondary education stakeholders to track student transitions across

Table 1: Career Readiness Metrics Framework

1. Access and Equity	Degree to which career pathways programs are accessible and serve learners equitably.
2. Education Accumulation	Course completion, learning and credit accumulation along the career pathway.
3. Skill Development	Assessment of academic, technical and employability skills.
4. Work-based Learning	Participation in and completion of activities that deepen classroom learning through the exploration of career fields and demonstration of skills in an authentic, real-world setting.
5. Transition Readiness	Preparation for the next step along learners' career pathways.
6. Learner Agency and Belonging	Learner development of self-concept, including occupational identity, self-efficacy, and the perceived inclusivity of the learning environment.
7. Post-program outcomes	Immediate and long-term outcomes for learners who complete career development programs.

education levels – spanning the K-12, two-year college, and four-year college and university systems – as well as into the workforce. Meeting this goal entails designing systems that are internally consistent and contain valid and reliable data that is collected and analyzed using formalized policies and procedures.

Acknowledgments

About

Advance CTE's Advancing Postsecondary CTE Data Quality Initiative (PDI) is exploring how state leaders can cultivate high-quality postsecondary data ecosystems that can assist postsecondary institutions in offering career pathways that meet learner interests and are aligned to a good career.

Through the PDI, Advance CTE is working with the Alabama Community College System, Delaware Department of Education, University of the District of Columbia Community College, Florida Department of Education, and Oregon Higher Education Coordinating Commission to develop and implement comprehensive action plans to improve the quality and use of postsecondary CTE data. Focus areas for grantees include improving data collection, developing local capacity to use data effectively, improving reporting and communication, identifying opportunity gaps and improving data linkages.

Endnotes

[1] See The State of Career Technical Education: Improving Data Quality & Effectiveness, which includes a 2019 survey of State CTE Directors about the type and quality of data included in their agency systems. https://cte.careertech.org/sites/default/files/files/resources/State_CTE_Data_2019.pdf

[2] Zastrow, Z. P., & Perez, Z. (2019, April). Using state data systems to create an information culture in education. Education Commission of the States. https://www.ecs.org/wp-content/uploads/Using-State-Data-Systems-to-Create-an-Information-Culture-in-Education.pdf

[3] The Education Commission of the States collects comprehensive data on states' efforts to build SLDS. See https://reports.ecs.org/comparisons/statewide-longitudinal-data-systems-2021-03.

[4] The Office of Alabama Governor Kay Ivy, Education Initiative. https://governor.alabama.gov/priorities/education/.