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Improving Measures of Student Progression

Lessons for Postsecondary
Competency-Based Education
Practitioners & Institutional
Research Professionals



This brief focuses on measures of student progression. This work is part of the CBE Student Outcomes Research Collaborative, a partnership between the American Institutes for Research and CBE programs at Brandman University, Capella University, DePaul University, Kentucky Community and Technical College System, Polk State College, Salt Lake Community College, and Texas A&M University-Commerce.

Introduction

The CBE Student Outcomes Research Collaborative is a multiyear partnership between the American Institutes for Research (AIR) and seven partner institutions focused on examining student outcomes in competency-based education (CBE) programs and comparing them to traditional programs. Along the way, we encountered challenges with traditional progress-related measures; in particular retention and enrollment status (part time versus full time at entry) seemed insufficient to understand progression given the structure and flexibility of CBE programs. Together, we developed seven new ways of examining progression better suited to understanding how students move through CBE programs.

Why Progression?

Progression-related metrics, visualizations, or graphics are aimed at describing how students move through their programs and accumulate knowledge and experiences that take them closer to the goal of earning their credentials.

At their core, these data describe the complexities of students' experiences while they are enrolled in institutions of higher education. If we can understand where students run into challenges, we can help them get one step closer to walking across the stage at graduation. And, given the increasing share of nontraditional students, resource constraints across all institution types, and skepticism nationally about the value of postsecondary education, the call for further insights into the student experience has grown louder, bringing much-needed attention to the field's progression-related metrics.

The main lesson from this added attention is that the progression metrics the field has created to date offer only limited insight into how students are moving through their

programs. Externally reported metrics, such as the Integrated Postsecondary Education Data System (IPEDS) retention, enrollment intensity, and graduation rates, reflect the minimum information needed for federal oversight of programs and institutions. Instead of examining how students move through the program, IPEDS data address institution-centered questions, such as the following: Of the students who were enrolled on a specific day in the fall, what share (1) re-enroll in any courses at that institution 1 year later (fall-to-fall retention), (2) enroll in enough coursework to qualify for the maximum student loan amount, or (3) successfully earn a credential within 4, 5, or 6 years? Also, although institutions with active institutional research offices have developed impressive new ways of analyzing students' progression, many schools only track and internally report retention and graduation metrics that align with external measures of performance.

¹Soldner, M., Smither, C., Parsons, K., & Peek, A. (2016). *Toward improved measurement of student persistence and completion*. Washington, DC: American Institutes for Research.

²Lurie, H., Mason, J., & Parsons, K. (2018). *State of the field: Findings from the 2018 National Survey of Postsecondary Competency-Based Education (NSPCBE)*. Washington, DC: American Institutes for Research.

Why CBE?

CBE programs present an opportunity to revise how we measure student progression.

By holding learning (competencies) constant while permitting students to vary their time frames, progression metrics must be reconstructed to show how students move toward completion along different routes. When students vary their pace throughout their learning journeys—by drawing upon prior knowledge or job responsibilities, stopping out and re-enrolling, or accelerating—and deviate from the traditional path of 15 credits per semester, they are no longer captured in commonly used progression metrics.

Although these new enrollment patterns are not unique to CBE (similar patterns emerge when examining other flexible programs aimed at part-time, online, or adult students¹), CBE is an approach that, in theory, is built specifically to accommodate these patterns.

The promise of improved progression metrics comes at an important moment for CBE programs nationally, as many higher education leaders expect this approach to grow.² For new and recent adopters, understanding the outcomes of postsecondary CBE students is important for assessing program quality reporting internally and externally, informing continuous improvement efforts, and communicating CBE's value to students, institutional stakeholders, and policymakers. In addition, CBE's use of mastery as the basis for advancement may lead to future research that shows a more direct connection between progression and student learning in CBE programs.

This brief describes the rationales for, uses of, and steps taken to build the set of improved progression metrics identified by the postsecondary CBE research team at AIR in partnership with members of the CBE Student Outcomes Research Collaborative. This work builds upon the Student Outcomes Metrics Framework released in 2017³ and is influenced by the growing body of research measuring student outcomes in CBE programs.⁴

This set of improved progression metrics is organized into three categories, and contains seven metrics in total. Presence metrics offer one dimension of information. They ask, “Is the student enrolled?” Intensity metrics add a second dimension by asking, “When students are enrolled, how many units are they earning?” Progression metrics add a third dimension—the context of their program length. They ask, “What do the students’ presence and intensity mean for how and where they are in the path to completing their credential?” To better reflect students’ experiences and account for the flexible nature of many programs, all of these metrics use a student’s perspective of time for measuring periods. That is, enrollment periods are measured as a certain number of days after each student’s first date of enrollment, rather than a set term start date.

Each of these metrics provides important information that is relevant to different questions and audiences. They provide a variety of ways to examine student progression and, taken together, offer a more complete picture of students’ progress in their programs.

³ Parsons, K., & Rivers, C. (2017). *Measuring student success in postsecondary competency-based education programs: Toward a student outcomes metrics framework*. Washington, DC: American Institutes for Research & Commerce, TX: Institute for Competency-Based Education

⁴ See, for example, Brower, A. (2016, July). *Navigating the CBE frontier: A new metrics framework for student and program success*. Retrieved from <https://ce.uwex.edu/wp-content/uploads/2016/01/Navigating-the-CBE-Frontier-A-New-Metrics-Framework-for-Student-and-Program-Success-Brower-1.pdf>; Mayeshiba, M., & Brower, A. (2017, February). Student success and retention using new definitions created for nonterm, direct assessment CBE. *The Journal of Competency-Based Education*, 2(1). Retrieved from <https://onlinelibrary.wiley.com/doi/full/10.1002/cbe2.1039>; Parsons, K., Mason, J., & Soldner, M. (2016). *On the path to success: Early evidence about the efficacy of postsecondary competency-based education programs*. Washington, DC: American Institutes for Research. Retrieved from <https://www.air.org/sites/default/files/downloads/report/Path-to-Success-Postsecondary-Competency-Based-Education-Programs-Oct-2016.pdf>; and Rivers, C. (2016, August). *Competency-based education: The importance of metrics and data collection*. Retrieved from https://evollution.com/programming/program_planning/competency-based-education-the-importance-of-metrics-and-data-collection/

Presence

- Retention 2.0
- Enrollment Status
- Student Enrollment Sequence

The first steps to understanding student progression involve **identifying if and when students were enrolled at the institution**. Using the traditional definition of retention as a starting point, the following three measures explore how expanding its time frame and specificity might make for a more useful measure for CBE programs.

Measures of student presence let us track if and whether students are still enrolled, which is the minimum first step for making progress towards completion—students are not on track to complete if they are no longer enrolled.

Retention, which is the traditional metric for monitoring student presence, only captures a snapshot of whether a student is enrolled one year (or one term) after matriculation. This approach overlooks whether students stop out and re-enroll during that first year as well as whether students were still enrolled after this first “check-in” and before completion. This may be a challenge in all programs, but is especially a challenge in CBE programs,

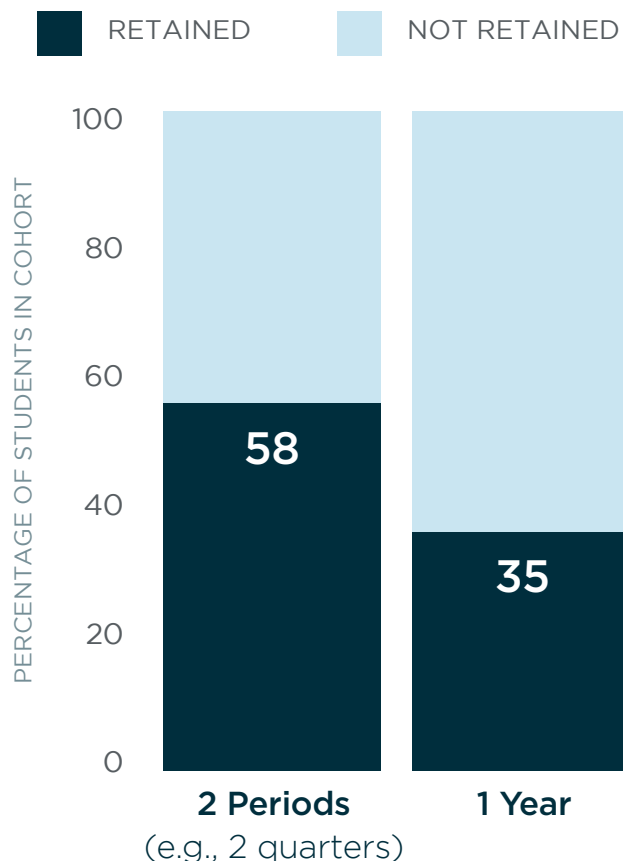
which are often designed to provide students more flexibility in their enrollment patterns. As it currently stands, retention also lacks the flexibility to accommodate programs with flexible term lengths and variable enrollment patterns, like most CBE programs.

We improve on the traditional retention measure by allowing for flexibility in Retention 2.0 and visualizing student presence in each period with our Enrollment Status and Student Enrollment Sequences measures. By expanding our window of observation to include the years between the first year and completion, we capture a more accurate picture of students’ presence and stopout patterns throughout their whole time in the program.

Retention 2.0

What it answers

Are students enrolled after some time has passed?⁵



Why CBE needs something new

Many CBE programs operate on a different enrollment schedule than traditional credit-hour programs.

Many CBE students start and stop more frequently, and at less regular times, than in traditional credit-hour programs.

How it is calculated

Retention 2.0 was designed to test two competing theories about the value of calculating retention: Is it the passage of a year or the passage of enrollment periods that is important? **For this reason, Retention 2.0 contains the following two alternate calculations:**

- 1. Year-based version:** Do we observe enrollment or completion (retention) at any time during a window *beginning* 365 days after initial enrollment and *ending* six months later?
- 2. Period-based version:** Do we observe enrollment or completion (retention) at any time during a window *beginning* two period lengths after initial enrollment and *ending* one additional period length later?

Strengths

Understanding whether students return in a subsequent period is a likely predictor of whether they will ultimately complete the program.

Challenges

Regardless of the calculation method (traditional, year based, or period based), Retention only provides a single snapshot of enrollment without offering insights into previous/future enrollment or progression. Coupled with program flexibility allowing students to enroll and stop out as needed, this makes Retention mostly irrelevant for CBE programs.

Questions for further exploration

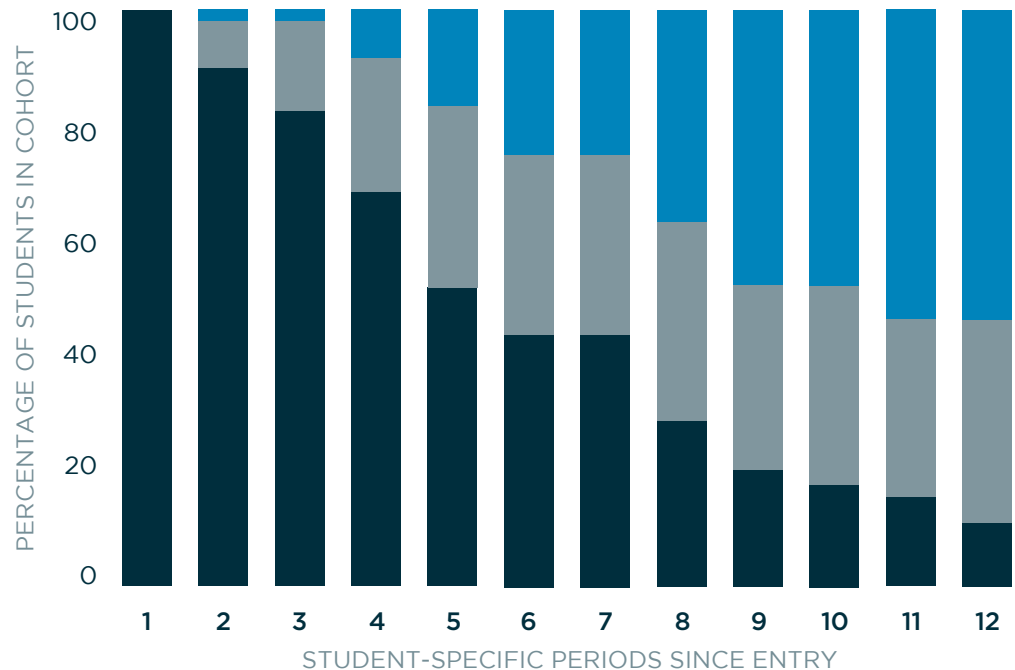
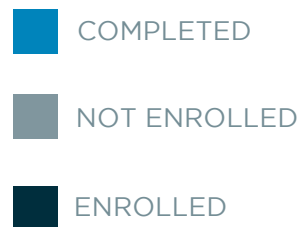
Is Retention still a meaningful measurement in CBE programs?

⁵ Here and in all following metrics, time (whether referenced in years or periods) is measured starting from each student's first date of enrollment. Given the continuous enrollment options offered in many CBE programs, traditional time windows such as fall to fall for yearly measures may be too broad to be meaningful.

Enrollment Status

What it answers

Across time, how many students are enrolled, not enrolled, or completed?



Why CBE needs something new

Many CBE programs operate on a different enrollment schedule than traditional credit-hour programs.

Many CBE students start and stop more frequently, and at less regular times, than in traditional credit-hour programs.

How it is calculated

Enrollment Status measures the share of a cohort that is enrolled or not enrolled in each period, or that has completed a credential by each period. To calculate Enrollment Status, sort each student's enrollment and completion records into student-specific periods, starting with their earliest enrollment as Period 1. Per period, indicate if the student has completed and whether enrollment was observed, with the completed status superseding enrollment. This leaves each student with one status per period. Aggregate these statuses by period.

Strengths

Offers a program-level view of student enrollment over time. The Enrollment Status metric provides a useful first look at a program's enrollment patterns and can provide guidance for which periods may be worth examining more closely.

Challenges

Enrollment Status does not show whether it is the same students unenrolling and re-enrolling or any of the characteristics of these students. This lack of detail prevents more meaningful program changes or targeting of supports. Enrollment Status simply highlights where to investigate the data more closely.

Questions for further exploration

How does the enrollment status of each student change over these periods?

Student Enrollment Sequences

What it answers

Are there patterns in student enrollment experiences across time?

- NOT ENROLLED
- ENROLLED
- COMPLETED

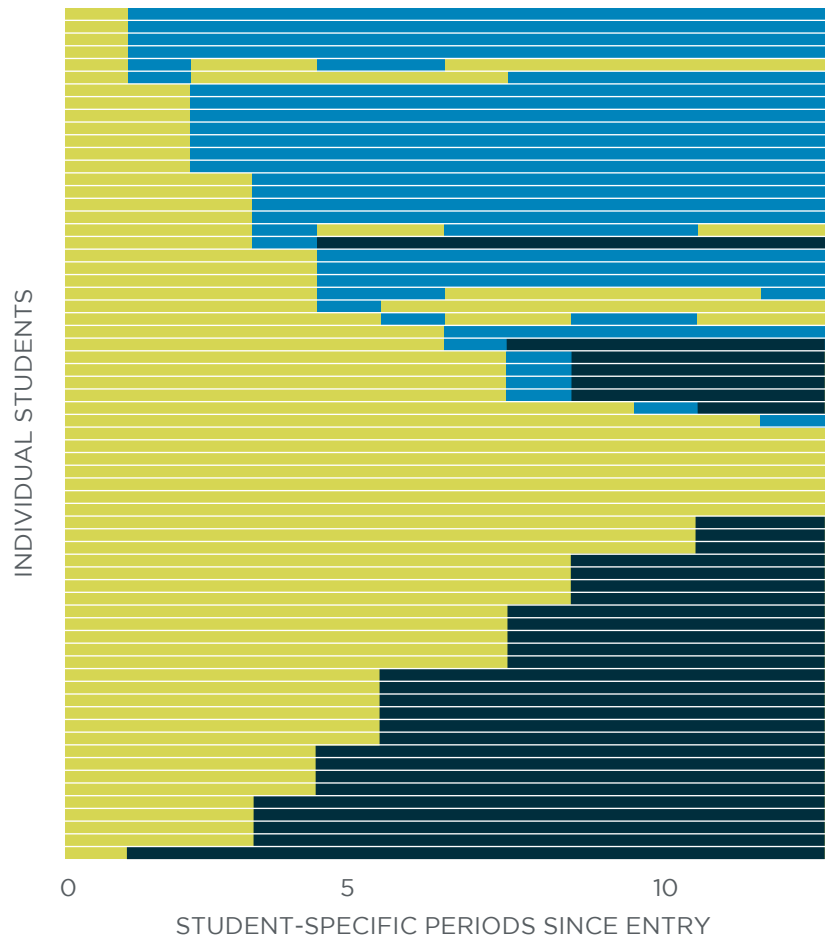
How it is calculated

Following the same steps as Enrollment Status, sort each student's enrollment and completion records into student-specific periods, starting with their earliest enrollment as Period 1. Per period, indicate if the student has completed and whether enrollment was observed, with the completed status superseding enrollment. This leaves each student with one status per period. Visualize by color coding by status, stacking students as "rows" and sorting by period on the x-axis.

Why CBE needs something new

Many CBE programs operate on a different enrollment schedule than traditional credit-hour programs.

Many CBE students start and stop more frequently, and at less regular times, than in traditional credit-hour programs.



Strengths

Provides a visualization of the enrollment status of each individual student in each period. Identifying common periods of stop-outs may inform program changes or targeting of support.

Challenges

Meaningful patterns in enrollment may not be readily apparent in certain sortings of this visualization.

Questions for further exploration

What are the reasons students stop out and re-enroll during the course of their studies?

Intensity

- Pace
- Unit Completion Ratio

Beyond knowing if and when students were enrolled at the institution, it is valuable to add another layer of detail that describes **how many units (credit hours, for most institutions) students are earning while enrolled**. Insights about students' intensity have long been dominated by the "full-time/part-time" distinction driven by federal financial aid regulation, which is often attached to students based solely on their enrollment in their starting terms. The intensity measures defined here put that aid-based designation aside and highlight changes across periods and variation among students in the cohort.

Taken as a whole, the Presence metrics in the previous section offer valuable information into students' experience, but still only reveal if students are present, not whether they are moving toward completion. Even in traditional programs, in addition to the full-time/part-time distinction, programs are increasingly considering the importance of understanding whether full-time students are enrolling in 12 or 15 credits.

Intensity measures such as Pace and Unit Completion Ratio improve upon measures of Presence by allowing us to see whether students are completing units efficiently and how quickly they are completing those units.

Pace

What it answers

At what rate do students earn units?

How it is calculated

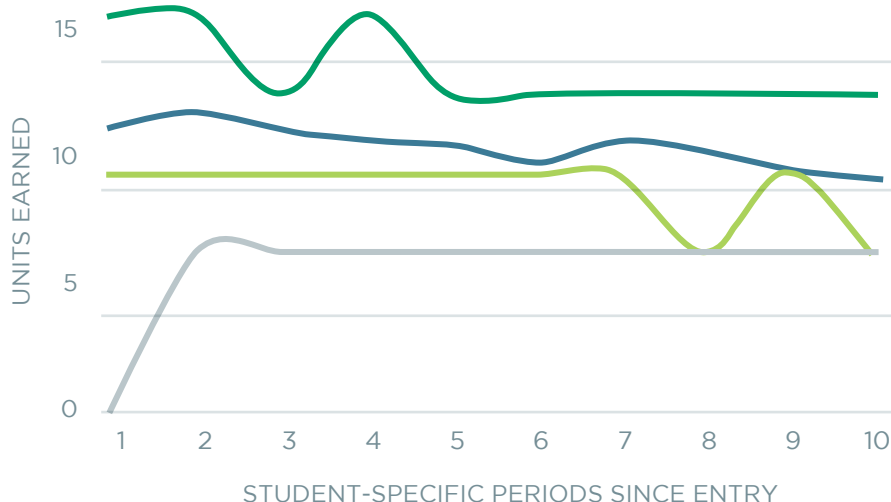
Pace measures a cohort's average and quartile values of units earned per period. This measure has been restricted to only those students in the cohort who are actively enrolled in each period. To calculate Pace, sum each student's earned units or credits by period, starting with their first period of enrollment. Calculate the cohort's mean and 25th, 50th, and 75th percentiles by period.

We recommend viewing Pace and Unit Completion Ratio simultaneously.



Why CBE needs something new

Pace may look significantly different in CBE programs compared with traditional credit-hour programs. Many CBE programs allow students to vary the number of units they can attempt during a period and/or have multiple, asynchronous start dates.



Strengths

This measure allows for a more nuanced understanding of enrollment intensity, which is likely to have more interesting variation in CBE programs than in traditional programs. The flexibility of CBE programs creates opportunities for greater variation between students as well as variation over time within an individual student's enrollment. Understanding the distribution of student pace can help organize students into "progression profiles" and be used to target supports and resources for students who are struggling. It also can highlight when students encounter program-level hurdles or accelerants.

Challenges

Some programs do not have explicit crosswalks between credit hours and competencies. For some institutions, a more meaningful version of this metric would be: "At what rate do students complete competencies?"

Questions for further exploration

How many units are students attempting in these periods?

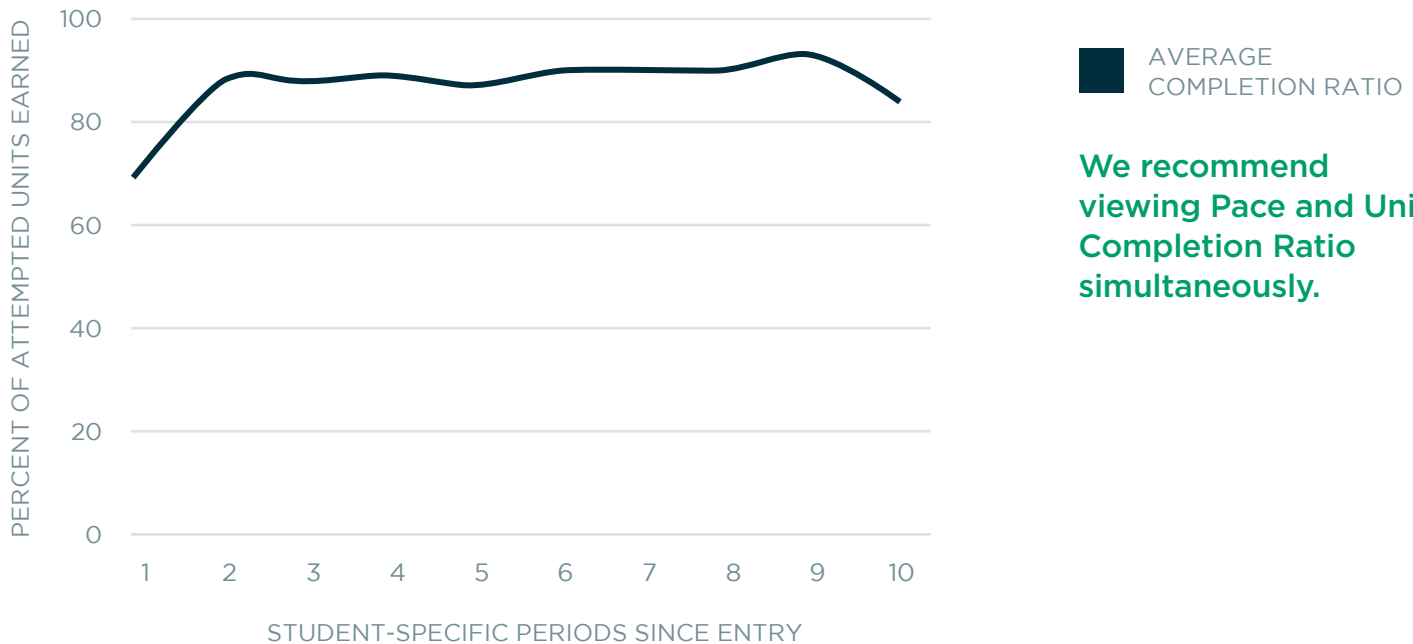
Unit Completion Ratio

Why CBE needs something new

Many CBE programs allow students to vary the number of units they can attempt during a period.

What it answers

How successful are students at earning the units they attempt?



We recommend viewing Pace and Unit Completion Ratio simultaneously.

How it is calculated

Unit Completion Ratio measures a cohort’s average percentage of attempted units earned per period. To calculate Unit Completion Ratio, start with students’ earliest enrollment as the beginning of their first period, then calculate the share of units students attempted that they earned per period. Calculate the cohort’s mean value by period. Just as with Pace, Unit Completion Ratio can be broken into percentiles, which may provide additional insights.

Strengths

Just as with Pace, large changes in students’ Unit Completion Ratios can help identify when students are encountering program-level hurdles or accelerants.

Challenges

Some programs do not have explicit crosswalks between credit hours and competencies. For some institutions, a more meaningful version of this metric would be: “How successful are students at completing the competencies they attempt?”

Questions for further exploration

Is there a weaker correlation between Unit Completion Ratio and credential completion in subscription model programs than in other CBE programs?

Progress

- Unit Accumulation
- Time to Milestone

The requirements for more representative measures of progression seem innocuous at first: capture how much or how little of a student's program has been completed. In truth, capturing this requires condensing an enormous amount of information about students' experiences. Looking back, Presence offers one dimension of information (Is the student enrolled?), and Intensity offers two dimensions (Of enrolled students, how many units are they earning?). Progression, however, contains *three dimensions* of information simultaneously: **What do a student's Presence and Intensity, within the context of their program, tell about their progress in completing their credential?**

True progression – progress toward completion of the program – is more than just understanding that a student is still present and their enrollment intensity. Ultimately, we want to understand how close students are to completing their credentials, and how they move toward that goal. This does not have a commonly-used analog in traditional programs or institutions, except perhaps categorizing students as sophomores, juniors, or seniors by the number of credits they have accumulated. It is critical to understand how students are progressing toward completion, and whether there are patterns or common roadblocks students face.

In this section, we offer two final visualizations as alternative methods to visualize progress: Unit Accumulation describes fine-grained, by-period individual data on students' cumulative efforts, and Time to Milestone relays cohort-level information about how students vary in elapsed time. We consider both exploratory, and look forward to working with institutions and continuing to advance the field's understanding of students' real progress toward completion.

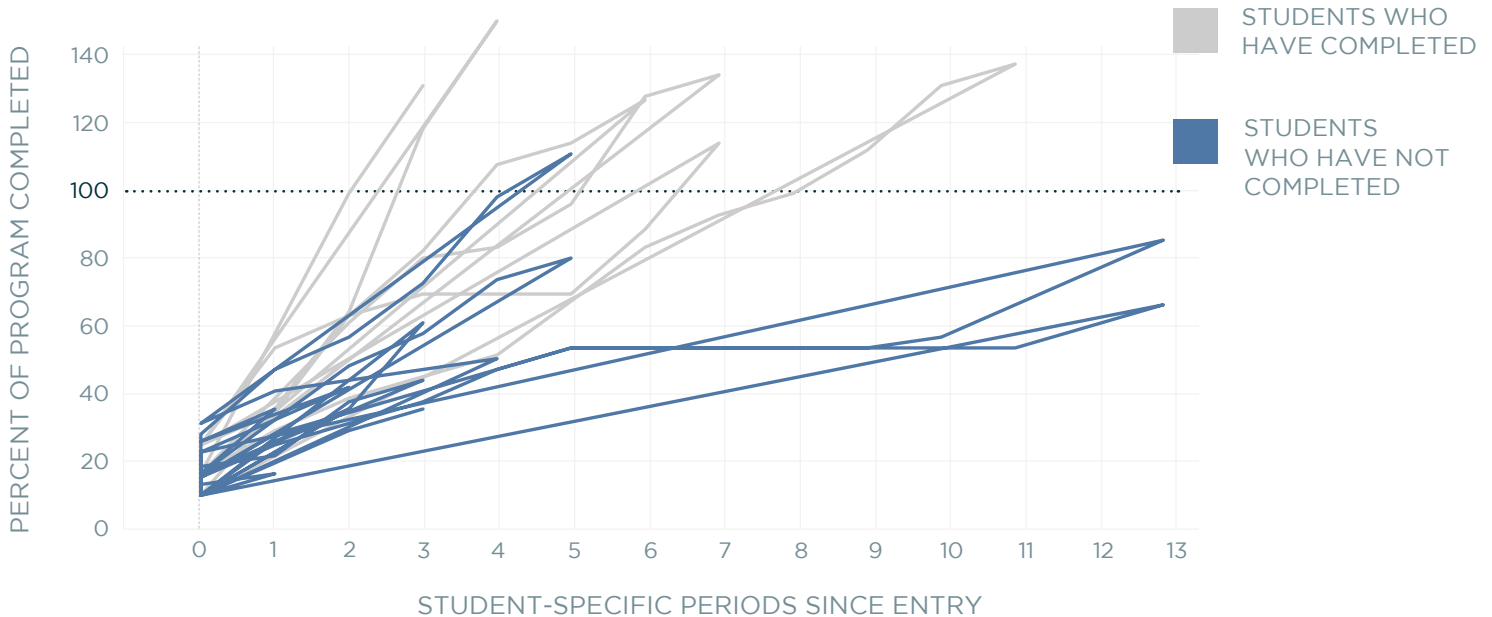
Unit Accumulation

What it answers

Are there patterns in student progression experiences across time?

Why CBE needs something new

The flexible nature of many CBE programs allows for large variation in the paths that students take to earning a credential.



How it is calculated

Unit Accumulation measures each student's unit accumulation (or share of program earned) over time. To calculate Unit Accumulation, divide each enrollment record's earned units by the program's total units required. This provides each record's "share of the total program earned." Starting with each student's first period, sum these "share" values to create a single record per student per period that describes the total share of the program accumulated by that time period.

Strengths

Provides a visual representation of each student's path through the program. Identifying trends in students' paths can inform where program redesign may be beneficial.

Challenges

It is difficult to clearly visualize a large number of students at once. This makes it challenging to discern program wide trends.

Questions for further exploration

Can we use this progression information to categorize students into "progression profiles" that can then be used to target supports for students?

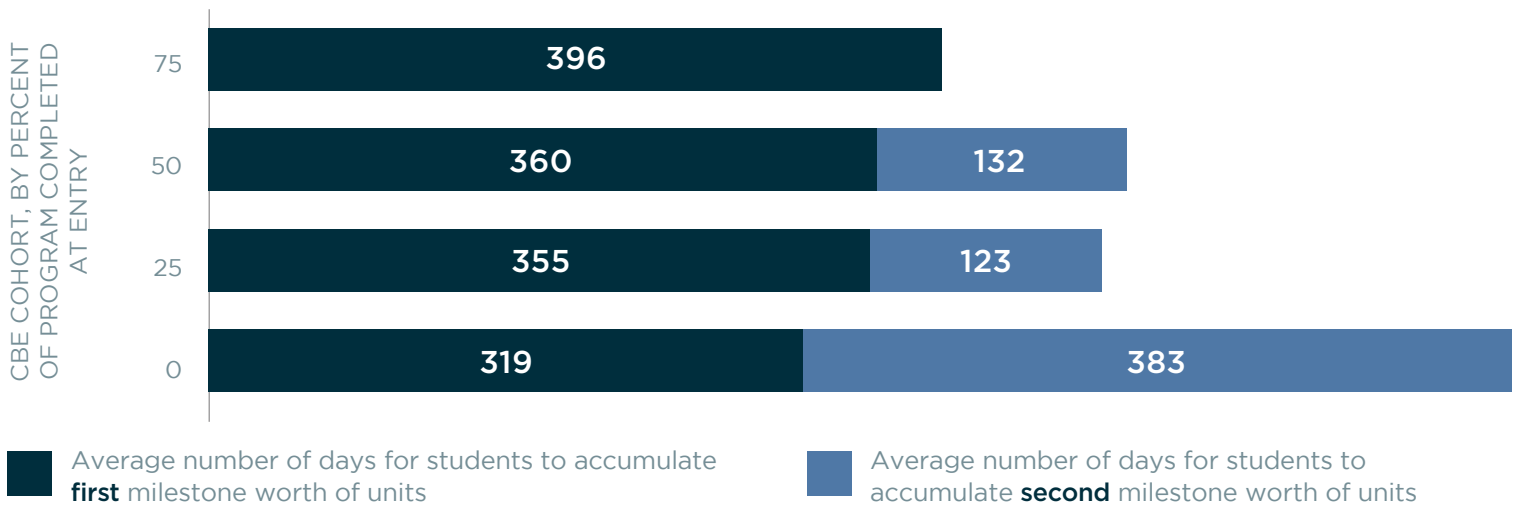
Time to Milestone

What it answers

How long does it take students to reach program completion milestones?

Why CBE needs something new

To a greater extent than traditional programs, CBE programs hold learning constant and allow the time to demonstrate this learning to vary. The shift from fixed to flexible periods of learning means we need new metrics, such as Time to Milestone, to capture variation between students and programs.



How it is calculated

Time to Milestone measures the average length of time it takes students to reach progression milestones. To calculate Time to Milestone, determine your program’s unit milestones (e.g., 30 units is a 25% milestone in a 120-unit program). Starting with students’ first period, calculate the number of days it takes them to accumulate enough units to meet those unit thresholds. Calculate the cohort mean by milestone or segment by prior credit (e.g., students entering with 0–24% or 25–49%, 50–74% and 75–100% of their program completed).

Strengths

Time to Milestone is a “true CBE metric” in the sense that it holds learning constant and measures the time it takes individuals to reach certain levels of learning. With it we can observe how quickly students are moving through specific portions of their programs, which can inform targeted supports.

Challenges

It is often difficult to determine if prior units count toward degree completion, which complicates the categorization of students by which milestones they already achieved through prior coursework.

Questions for further exploration

Can we use this progression information to categorize students into “progression profiles” that can then be used to target supports for students?

Looking Forward

These metrics, or, more accurately, a set of progression-related measures, visualizations, and graphics, are most valuable in their ability to raise further questions, not merely to answer their most directly related questions. Why do students' first 30 units take the same amount of time, regardless of how many prior credits they have at entry? How do we target supports in the first three periods, where the most students are lost? What might be causing Pace to drop in a student's fourth period, regardless of when the student started in the calendar year? Further contextualizing results will likely play an important role in making these data helpful; for example, by exploring how results vary by quartile or examining differences by student characteristics.

In addition, the act of creating these metrics prompts a thorough and constructive review of student data that may prove valuable for practitioners. Examining these data can help CBE leaders better understand the implications of their program design, identify and resolve data oddities, and build working relationships with relevant stakeholders across their institution (such as institutional research, registrar, or financial aid).

Last, improving progression metrics will help us better understand students' learning journeys because of how CBE programs directly connect demonstration of competency to program progression. Because there is no common "unit of competency" or "unit of learning," however, these measures do not fully reflect students' learning and cannot be used to compare different programs or institutions. Although the continuing challenge to understand and measure learning remains, we hope this work supports and informs future research.

We anticipate these metrics will continue to evolve with the CBE field as it continues to mature.

We invite interested program leaders or researchers to join us in refining and testing these measures.

AIR is grateful to Lumina Foundation for its support of our research about student outcomes in postsecondary CBE programs, which informed this brief.

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