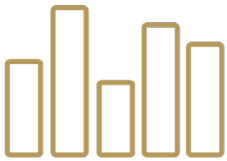

STRATEGIC DATA PROJECT

Understanding patterns of success among postsecondary CTE students: A diagnostic for institutional and system analysts

This diagnostic was prepared with support from the ECMC Foundation. This diagnostic was prepared by Chris Avery, Jon Fullerton, Brian Johnson, Adrienne Murphy, Alyssa Reinhart, and Elise Swanson (listed alphabetically). The authors would also like to thank members of our Advisory Board: Joel McKelvey, Sue Mukherjee, Christopher Leake, and Jessica Cunningham, as well as Miriam Greenberg and the ECMCF SDP CTE Fellows for their feedback and guidance throughout the development of the tool.

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Introduction

Background and Context

Institutions are increasingly offering Career and Technical Education (CTE) credentials aimed at helping students succeed in the workforce. The number of sub-baccalaureate degrees awarded increased 70 percent from 2001-02 to 2014-15 and the number is projected to continue to grow over the next 15 years (Husser & Bailey, 2018). Further, 74 percent of students awarded sub-baccalaureate credentials earned them in occupational, rather than academic, programs (Hudson, 2018), underscoring the important role CTE is playing in a changing postsecondary landscape.

CTE programs tend to serve a more diverse population than other programs. Students are older, more female, and more economically disadvantaged than other postsecondary students (NCES, 2018). While the majority of CTE students are White (54 percent), the percentage of Black and Hispanic students is larger in sub-baccalaureate occupational programs than in sub-baccalaureate academic or bachelor's degree programs (NCES, 2018).

Given that postsecondary CTE programs are increasingly serving students who have not historically been served by higher education, it is especially important to know more about the outcomes of students participating in these programs. Limited research on postsecondary CTE participation shows mixed results (and significant variation by subgroup and study area) in long-term earnings and employment outcomes (Hollenbeck & Huang, 2003; Jenkins, Zeidenberg & Kienzl, 2009; Bahr, 2016; Bettinger & Soliz, 2016; Anderson et al. 2017), as well as degree and credential attainment (Jenkins, Zeidenberg & Kienzl, 2009; Xu & Trimble, 2016; Kurlaender, Stevens & Gross, 2015; Anderson et al. 2017). However, these findings are general and provide little guidance to leaders of CTE institutions about the challenges facing their specific students and possible actions that could improve their students' outcomes. Institutional data and research capacity to answer institution-specific strategic questions about CTE programs is needed.

CTE Diagnostic Overview

This Diagnostic is intended to provide analyses that will help leaders at community and technical colleges develop and pursue strategic inquiries into patterns of student success. This document's primary audience is analysts looking to provide actionable information to institutional leaders. While we offer proposed questions, visualizations, and variable definitions throughout the Diagnostic, it is meant to be a flexible framework that supports a careful examination of factors contributing to students' success outcomes. In other words, you should tailor the analyses, operationalizations, and analyses to fit your needs and context. This Diagnostic is structured around four questions that are critical to answer for institutions seeking to improve their students' success.

1. Are students more likely to complete some pathways than others? Are pathways equitably supporting students with different levels of academic preparation and students of different demographic characteristics to successful outcomes?
2. Are students dropping or transferring out of some pathways more than others? Where do they go?
3. Are there some required or "gateway" courses that are getting in the way of completion for some pathways?
4. What credit accumulation patterns set students up for longer-term success? How many students are following these patterns?

We recommend that all analysts engaging with this Diagnostic compile the summary statistics described in Section 0 (Getting Started) and outcomes information described in Section 1 (Completion) to get a sense of basic patterns of access and success at your campus. The remaining three sections each probe a different potential root cause for student success patterns. You may choose to complete all three sections or choose those that seem most relevant for your institution or context.

For each section, this Diagnostic provides the following:

1. A framework for exploration – background and context, including additional research, guiding questions, and information for interpretation and next steps
2. Example visualizations – chart mock-ups to show how the results of these analyses could be communicated
3. Analysis summaries – details on the steps taken to conduct the analyses. The analysis summaries provide enough detail for analysts to recreate the analyses outlined in this Diagnostic for your institution, regardless of statistical software (additional detail provided in the Technical Companion)
4. Data specifications – data sources, elements, and structures needed to complete these analyses (provided in the Technical Companion)
5. Code files – Stata .do files for use (available on the OpenSDP Github)

While we do offer some context for the importance of each question and potential implications of results, you will need to understand the results in the context of your own institution to generate action steps from these analyses. We recommend connecting with stakeholders at your institution to decide which pathways to compare and to discuss and interpret results.

How to use the Diagnostic most effectively

This Diagnostic is designed to be a flexible framework for examining how students are progressing through various pathways and to begin to probe potential root causes of student progress and success rates. The results of these analyses are designed to generate more questions, which will require further inquiry. For example, you may notice that success rates in certain pathways are lower than desired and that there are gatekeeper courses that appear to impede students' progress. You can then work with institutional leaders and faculty to brainstorm potential actions to get more students through these courses, such as hiring more tutors

or offering support courses. These interventions can then be evaluated for their effectiveness when implemented on your campus. Approaching this Diagnostic as a resource to spark conversations and questioning around student success outcomes will allow you to focus on the issues most relevant to your context and to determine next steps to support student success. To reinforce this structure, we have labeled each of the analyses with the specific question they help answer. By working through these questions, you can determine what challenges your institution faces, and potential root causes you could address.

Key Terms

- **Credential:** Associate degree, certificate, diploma, or other qualification that signifies culmination of a program of study
- **Completion:** Attainment of a credential of any form
- **Pathway:** classification of area of study most relevant to the institution, such as Classification of Instructional Programs (CIP) code or meta-major
- **Credit accumulation:** Credit hours earned
- **Credential threshold:** Accumulation of credits based on timely progression towards completion (for example, 60 credits for an associate degree in 2 years)

Section 0: Getting Started

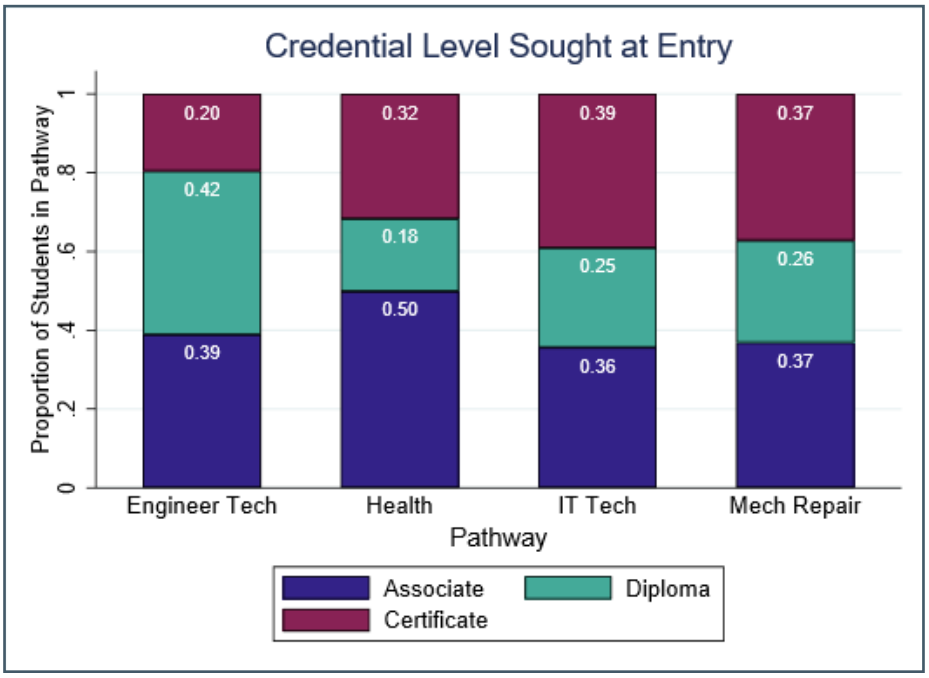
As this Diagnostic is designed to explore patterns of student success and their possible determinants, an important first step is to either review or pull together some foundational analyses that examine the characteristics of students enrolled in different pathways. Before engaging with the analyses, you should first decide how to define key variables so that the analyses are most useful for your local context. The first definition you need to determine is that of "pathway". We use the term "pathway" flexibly throughout this document to refer broadly to a student's course of study, but this could be operationalized as a certificate program, major, meta-major, CIP code, or any other grouping of interest.

Specifically, we recommend pulling the following information for each pathway of interest:

1. Average high school GPA of students
2. Share of male and female students (or a full breakdown by gender if you can disaggregate beyond traditional binary values)
3. Share of students in each racial/ethnic group recorded in your administrative data
4. Share of students by parent or guardians' highest level of education (e.g., less than a high school diploma or GED, a high school diploma or GED, completed any college, BA or higher)
5. Share of students eligible for a Pell grant
6. Share of students in a given pathway pursuing each of the credential levels offered by that pathway (for example, associate degree, diploma, and certificate)

Compiling these descriptive statistics allows you to see which students are enrolling in different pathways. These descriptive statistics may be presented in a single table, as a series of charts, or some combination of charts and tables. These data points are helpful to contextualize differences in completion rates or other outcomes across pathways and may help your institution develop interventions and supports that are responsive to students' identities and needs. We also recommend comparing the characteristics of students enrolled full and part time within pathways to better understand which students are choosing which enrollment option. As we recommend conducting the analyses outlined in this Diagnostic separately for full and part time students, these descriptive statistics also provide context for understanding which students' experiences and outcomes are being portrayed by each set of analyses. Figure 1.0 offers an example of how to present students' credential intentions across pathways, a key consideration when deciding which pathways to compare in your analyses.

Example Visualization 0.1: What credentials do students intend to earn when entering a given pathway?



Understanding the Chart

This chart shows the share of students in each pathway pursuing different credential types. This varies across program. For example, half of all students entering the Health pathway intend to earn an associate degree, while the most comm degree intention among students in Engineering Technology is a diploma. Understanding what credentials student intend to earn helps us anticipate how long it will likely take students to complete and highlights which pathways may be best positioned to share lessons/ best practices to support students with each other.

In this chart, and the charts that follow, the outcome is often a probability or a proportion. Because these values are always a fraction, they naturally exist on a scale of 0-1. These values can also be understood as percentage points if they are multiplied by 100.

Section 1: Completion

Questions

Do different pathways have different completion rates? Are there differences in completion rates across pathways for students who enter with similar background characteristics?

Goal/Purpose

In this section, you will compare student outcomes across pathways. We focus on student transfer to another institution or completion of a credential, but your definition of "successful outcomes" might differ depending on your institution's context and questions. Looking at student outcomes allows you to engage with the broader question of whether the pathways at your institution are accomplishing their goals. In other words, are students being adequately supported to succeed in their chosen pathway?

By comparing outcomes across pathways, you can also see whether there are pathways that are further along in meeting their student success goals than others and conduct follow-up studies to understand what practices those pathways are leveraging to support students. When looking at differences in outcomes across pathways, keep in mind the differences in student characteristics across pathways before making judgments about pathway success. Each program is enrolling a unique population of students, and, therefore, one might expect different outcomes. However, by examining patterns across pathways, you can have better-informed and deeper conversations with programs about what might be working and what could be strengthened. The analyses presented in this section illustrate the extent to which students are progressing through a given pathway. These analyses allow one to compare student outcomes across pathways, but we leave it to your judgment to determine which pathways are relevant to compare. For example, you may not want to directly compare programs that typically lead to an associate degree with programs that typically lead to a certificate or diploma.

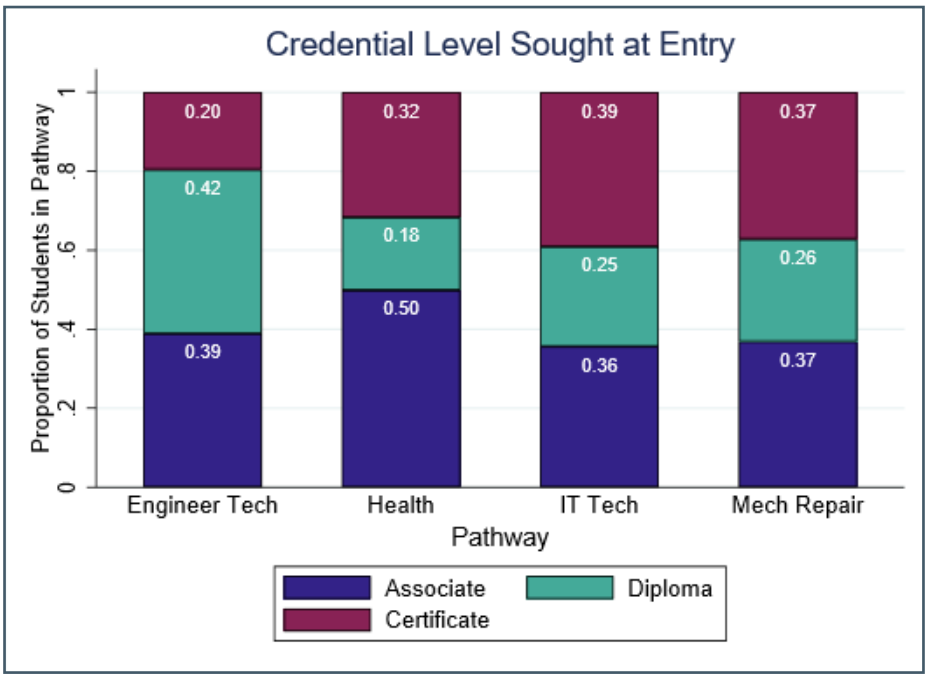
The results of these analyses can inform further discussions at your institution or system about which programs are seeing their students succeed and what practices or structures they may be leveraging that could support students in other pathways.

Reading for Context

- Completing College Nation and State Reports https://nscresearchcenter.org/completing-college/
- Bailey, T. R., Jaggars, S. S., & Jenkins, D. (2015). Redesigning America's community colleges: A clearer path to student success. Harvard University Press. Redesigning America's Community Colleges: A Clearer Path to Student Success
- Jacob (2018): Building Knowledge to Improve Degree Completion in Community Colleges

Our first analysis shows whether students' likelihood of completion or transfer varies depending on what pathway they pursue. We focus on the first outcome that students achieve to avoid double-counting students who attain more than one milestone (e.g., transfer and subsequent completion). Critically, this is a descriptive analysis that does not account for student background characteristics, program context, or other factors that influence student outcomes. Because these results take no account of which students enroll in which program, they should not be interpreted to mean that one program is outperforming another, but rather should encourage deeper questioning and discussion across pathways.

Example Visualization 1.1: What is the likelihood a student in a given pathway will experience a successful outcome?



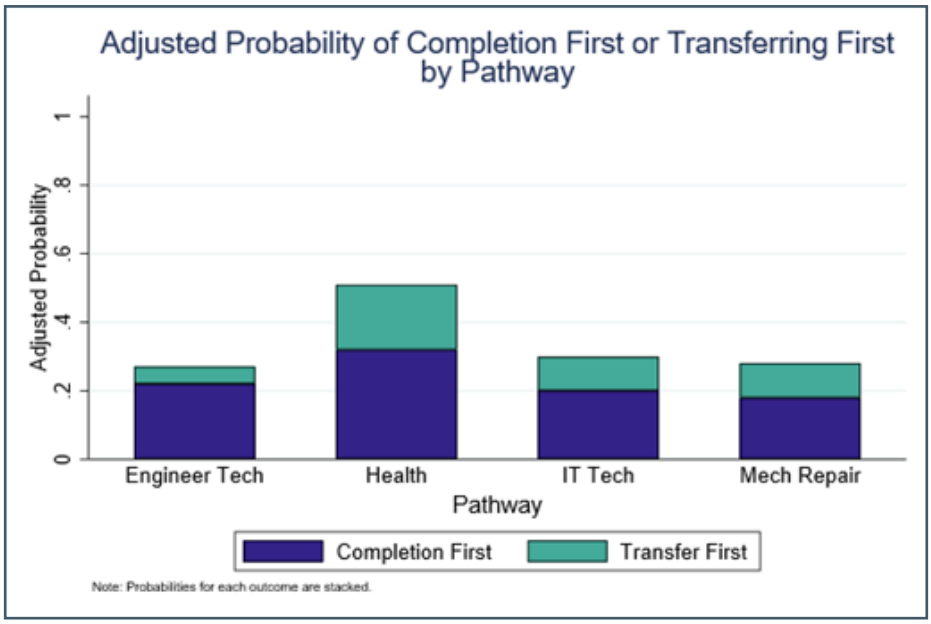
Understanding the Chart

This chart shows the probability that a student will have a successful outcome, conditional on their pathway of entry. We see differences across pathway. For example, among students entering the Health pathway, the probability that a student will earn a credential or transfer to another institution is around 50 percent. In contrast, the probability that a student entering Mechanical Repair will complete or transfer is only slightly above 20 percent.

The next piece of this analysis looks at differences in the probability that a student will transfer or complete a credential across pathways while accounting for students' background characteristics. This allows us to compare outcomes of students who are observationally the same on a set of variables but who enrolled in different pathways. We include as controls students' gender (measured as a binary male/female), age at enrollment, race/ethnicity (disaggregated to Asian, Black, Latina/o/x, White, and other/unknown), Pell dollars awarded in the first year, high school GPA, and mother's education level (less than high school, high school,

GPA, and mother's education level (less than high school, high school, college or more). You may want to adjust these covariates depending on what is relevant to your context and available in your data.

Example Visualization 1.2: What is the likelihood a student in a given pathway will experience a successful outcome, after controlling for their background characteristics?

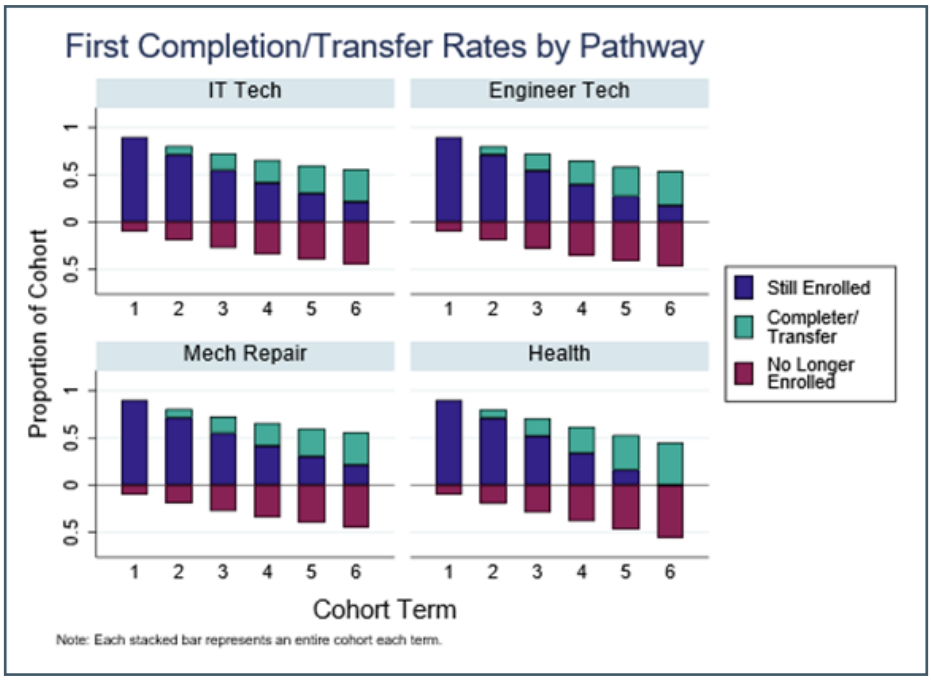


Understanding the Chart

This chart shows how two students, who are the same on all observed characteristics, have differing probabilities of success based on which CTE pathway they choose to enroll in. Similar to the prior chart, the probability of success for students in the Health pathway is about 50 percent. However, we see changes in the probability of success between the unadjusted and adjusted graphs for other programs, like Engineering Technology and Mech Repair. These results suggest that students in Mech Repair do better than we would expect given their observed characteristics, while those in Engineering Tech have a lower probability of success than we would expect just based on background characteristics.

To go deeper into the question of the extent to which programs are supporting student success, we look at student outcomes over time. We look over term-by-term for students' first three years to see what share of students are still enrolled in college, what share have completed a credential or transferred, and the share of students who are no longer enrolled. This analysis can help your institution identify key moments in students' experience when they may need additional support to stay on track to a successful outcome.

Example Visualization 1.3: What are students' enrollment decisions and success outcomes over time?



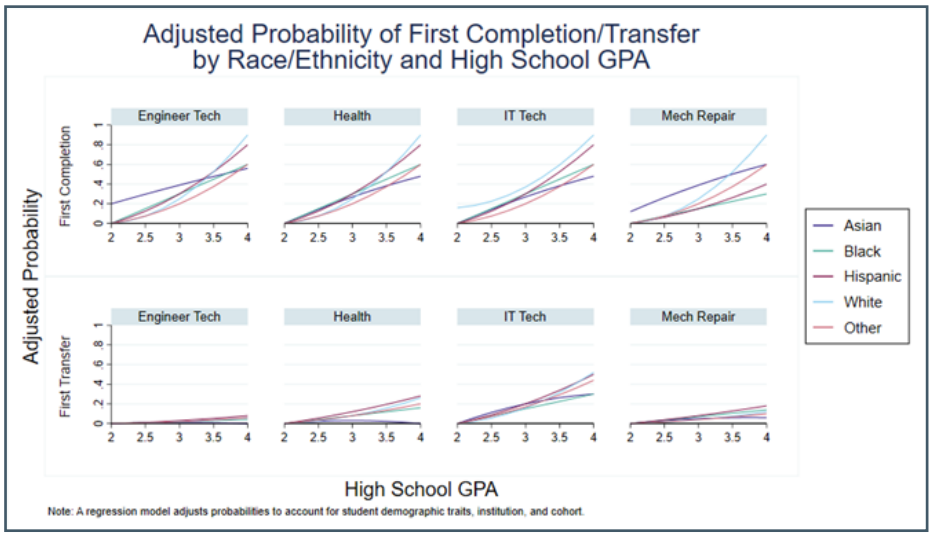
Understanding the Chart

In this chart, we see the share of students in a particular pathway who are still enrolled in that pathway, who have completed a credential or transferred, and who are no longer enrolled in higher education in that term. For example, in Health we see that in the sixth term, just under half of all students have completed or transferred and just over half are no longer enrolled. In contrast, in IT Tech we see that in the sixth semester about half of all students are no longer enrolled, a little over a quarter have completed or transferred, and just under a quarter are still enrolled.

In the fourth analysis of this section, we look at how the probability of success varies across pathways and student background characteristics. Specifically, we look at the adjusted probabilities of transfer and completion for each pathway by gender, mother's educational attainment, and race/ethnicity, across different values of high school GPA, Pell award amounts, and age at entry.

It's important to think carefully about the implications and interpretation of these probabilities, particularly when looking at those for demographic characteristics. These are not causal estimates- if there are differences by gender in students' likelihood of completing, this does not mean that students of one gender are better or more capable students. Instead, you should take this as an opportunity to reflect on the support you offer students and how that support may need to be tailored to different groups so that all students have equitable opportunities to succeed. In what ways is your institution recognizing and leveraging the strengths that each student brings to promote equitable success? For which students does your institution need to continue to improve?

Example Visualization 1.4: How does the likelihood a student in a given pathway will experience a successful outcome vary across background characteristics?



Understanding the Chart

This chart shows how students' probability of success changes at different levels of high school GPA, disaggregated by students' race/ethnicity. Looking at the first row, we see positive associations between GPA and likelihood of completion for students in all pathways and from all racial/ethnic groups. However, there are differences across groups that highlight areas where additional scrutiny and work may be needed to offer equitable opportunities for success. For example, in IT Tech (the third graph), we see that at all points of the GPA range, White students have a higher probability of completing a credential than students of any other race/ethnicity. In Mech Repair, the slope of the line relating GPA and likelihood of completion is much steeper for White students than Black or Latina/o/x students, so while students with lower GPAs have similar probabilities of success, when we look at students with higher GPAs White students have much higher completion rates than students from any other group. This suggests institutions may not be meeting students' non-academic needs or may not be fully leveraging the academic ability of all of their students.

Reflections

Importantly, while we are controlling for some student characteristics, these analyses do not control for all background characteristics (such as motivation) or structural conditions (such as systemic oppression) and thus cannot allow us to determine for certain whether differences in success outcomes are due to the programs or the students. However, these analyses should spur additional reflection and thinking around whether these results are unexpected or aligned with program goals, and discussions of whether any changes should be implemented and evaluated moving forward. For example, you may notice that differences in completion rates between pathways remain similar after controlling for student characteristics. If this is the case, it suggests that differences between students choosing those pathways are less likely to be driving

differences in outcomes across pathways. This in turn means that there are likely programmatic changes or policies your institution can implement to improve student outcomes.

Discussion questions for institutional teams:

1. What are students' probabilities of success in various pathways at your institution? What surprised you about the patterns of success across pathways?
2. Does students' probability of success change when you control for background characteristics? If not, what sort of supports does your institution currently offer students to promote success?
3. What hypotheses do you have about what might be the root causes of the patterns of success you see?

Section 2: Mapping Student Progression

Questions

What decisions do students make in their first three years? Are students transferring between pathways in ways that may slow their progress?

Goal/Purpose

The second section of this Diagnostic pushes you to dig deeper into explanations or questions that may arise from the set of analyses in Section 1. For example, you may wonder why certain pathways have low completion rates. One possible reason could be that completion rates are related to patterns of student churn within the institution. If students are switching pathways multiple times, completion may be delayed, especially if there is little overlap in the requirements across the pathways. As the prior analyses only revealed the relationship between starting in a particular pathway and experiencing any sort of success outcome (transfer or completion of any credential), you may also be curious to know whether students in a given pathway earn a credential in that pathway or another area. This section helps you explore these questions. Specifically, at the end of the analysis described in this section, you will have a chart that illustrates students' progression in the pathway over time, from their first term of enrollment to a later term by which your institution would expect the student to achieve a successful outcome (for example, at the end of three years if studying programs that typically offer associate degrees). The number of terms or time periods included in the analysis should be tailored to your institution's context, expected duration of a program, and data availability.

Reading for Context

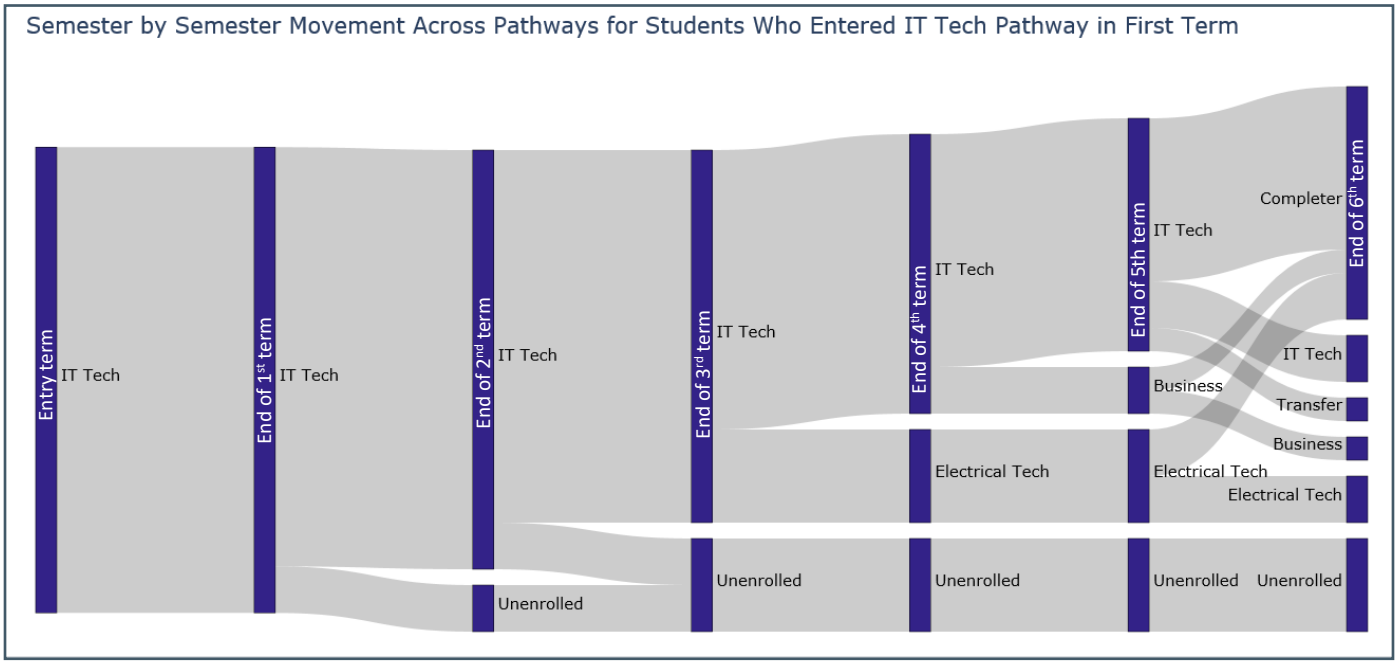
- Bailey, T. R., Jaggars, S. S., & Jenkins, D. (2015). Redesigning America's community colleges: A clearer path to student success. Harvard University Press.

Reading for Context Cont.

- Scott-Clayton, J. (2011). The shapeless river: Does a lack of structure inhibit students' progress at community colleges? (CCRC Working Paper No. 25, Assessment of Evidence Series). New York, NY: Columbia University, Teachers College, Community College Research Center.
- Holzer, Harry J. and Sandy Baum. Making College Work: Pathways to Success for Disadvantaged Students. Washington, D.C.: Brookings Institution Press, 2017.

Our analysis shows whether students remain enrolled in their original pathway, switched to a different pathway, transferred to a four-year institution, completed any credential, or were not enrolled at the end of the examined time period. To illustrate the students' journey, we use an interactive diagram to graphically show the size of the flow of students through the six semesters and the potential outcomes observed in each semester. When you produce this chart in Python (example code will be shared separately), users can hover over any particular flow in the chart to see the exact number of students making that transition.

Example Visualization 2.1: How do students move between pathways and towards success over time?



Understanding the Chart

This chart shows how students transition between pathways over time. Each of the blue vertical lines represents a transition point- from their initial enrollment to the end of their sixth term. The example chart focuses on students who begin enrolled in IT Tech. Most students remain enrolled in this pathway and have completed by the end of their sixth semester, although a sizeable share exits after the second and third semesters. We also see a share of students switching to other pathways, primarily Electrical Tech and Business. These students are still enrolled after six terms but have not completed a credential or transferred.

Reflections and Limitations

This analysis documents students' choices regarding their enrollment over time. It does not show why students make decisions to switch pathways. In other words, we do not know whether students switching pathways have discovered they are not interested in the career the pathway leads to or whether students feel unprepared for that pathway or whether there is something in the program offerings of that pathway that make the student feel unwelcome.

In addition, this analysis does not show stacking of credentials or churn between institutions. Once a student has transferred or completed a credential, that classification is carried forward for the remaining semesters of the analysis – even if the student earns additional credentials or transfers again.

Discussion questions for institutional teams:

1. What share of students are completing a credential in their original pathway?
2. When students switch pathways, are they typically switching once or moving multiple times? How closely related are the pathways students are moving between?
3. How long does it take students who do not switch between pathways reach a successful outcome? How long does it take those that do switch?
4. Why do you think students might switch between pathways? When could this be beneficial and when might it be harmful?
5. What support or guidance does your institution offer students for deciding whether to switch pathways and, if students are switching, which pathway might be a good fit and how long they should expect to complete a credential in the new pathway?
6. What hypotheses do you have about what your institution could do to limit student churn between pathways?

Section 3: Gatekeeper Courses

Questions

Do certain pathway classes impede students' progress towards a successful outcome?

Goal/Purpose

The third section of this Diagnostic helps institutions explore another potential root cause of low student success rates by focusing on identifying challenging and consequential courses, which we refer to as gatekeeper courses. This section focuses on students' experiences in core content courses and relates those experiences to eventual outcomes. You may have noticed in the first section of the Diagnostic that completion rates are lower than desired and wonder whether students get pushed off track in their general education courses, pathway-specific content courses, or in other areas. Your institution may wonder whether introductory math courses, for example, present a roadblock to students in a nursing program. This section presents analyses that will help you illustrate these trends. By examining these trends and understanding where course failure strongly predicts a reduced likelihood of completion and which courses are failed by large groups of students, institutions and programs can be strategic in thinking through what courses may need to offer students additional academic support or test new instructional methods to help students succeed. As descriptive analyses, results from this section will not show whether certain instructors are more effective than others, or whether failing certain classes cause students to exit without earning a credential or are simply a sign of trouble elsewhere. Instead, they highlight courses that are stumbling blocks for students, which can then inform further inquiry into what practices or supports could help students succeed.

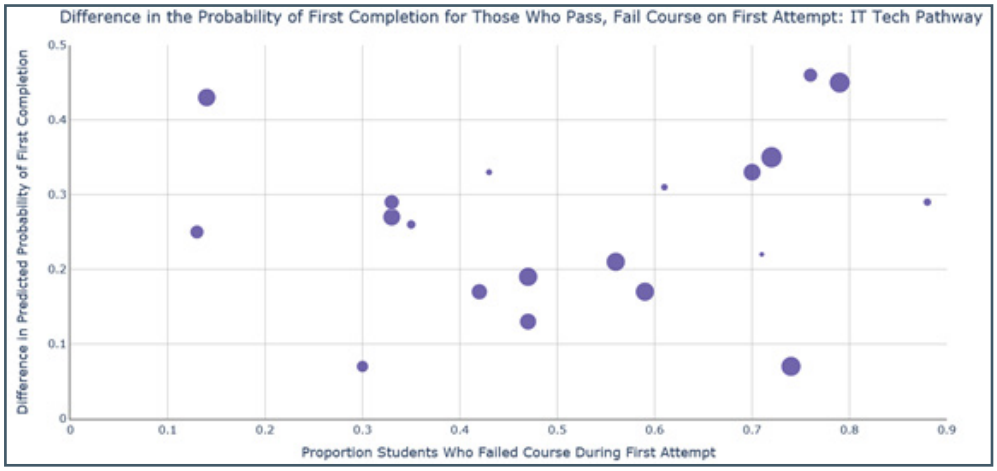
Reading for Context

- Bahr (2011). Deconstructing Remediation in Community Colleges: Exploring Associations Between Course-Taking Patterns, Course Outcomes, and Attrition from the Remedial Math and Remedial Writing Sequences. Research in Higher Education, 53, 661-693. https://doi.org/10.1007/s11162-011-9243-2

This analysis identifies courses that are important for students to complete a pathway. For our analysis, we focused on core content classes in the student's pathway as well as general education classes. You could define the set of potential gatekeeper courses differently; for example, looking specifically at courses required for a credential in a particular pathway. We create an interactive scatterplot that plots the share of students failing a course against the change in probability of completing a credential if the course is failed compared to passed. The size of each point reflects the number of students attempting the course. When interpreting this chart, we can think of large points with a high failure rate and a large associated decrease in probability of completion (e.g., a large point in the top right of the graph) as the most concerning from a student success perspective. When you create this in Python (sample code included separately), you'll have an interactive chart that allows

you to scroll over an individual point and see the course title, number of attempters, and the probabilities of completion conditional on passing or failing. Example Visualization 3.1 provides a still image of the interactive chart.

Example Visualization 3.1: Which courses represent the biggest impediments to success?



Understanding the Chart

This chart shows the extent to which students in the IT Tech pathway may be impeded by gatekeeper courses. In the scatterplot, we see that a number of courses associates with IT Tech (for example, courses in the IT department) have failure rates above 40% and that in most cases course failure is related to a change in likelihood of completion of 20 percentage points or more. These size of the points indicate that many students in the pathway are attempting these courses, so large groups of students may be derailed by these courses.

Reflections and Limitations

Note that this analysis includes both developmental and transfer-level courses. By examining which courses have high rates of failure and association with a large decrease in the probability of completion given failure, your institution or system will be able to identify trends in the types of courses that appear act as barriers to student success. While this analysis cannot tell us for certain whether the course itself is challenge, it can help your institution or system develop further lines of inquiry into where students are struggling and how instructional practices, student services, or other structures could be leveraged to best support student success.

Discussion questions for institutional teams:

1. Which courses at your institution have high failure rates? In which classes is failure most consequential for student success? Which courses have both high failure rates and large associations with negative outcomes?
2. What is the format of these gatekeeper courses (lectures, labs, etc.)? What supports do students have access to when enrolled in these courses?
3. Do students make use of on-campus academic support services like tutoring? If not, what might be some barriers preventing students from utilizing these resources?
4. What are the characteristics of students enrolling in these gatekeeper courses? Are there differences in failure rates across student subgroups?
5. What hypotheses do you have about how to improve course success rates? To make any given course less consequential for students' overall success? To make patterns of course success rates equitable?

Section 4: Credit Accumulation

Questions

How do students accumulate credits in their pathway over time? How do students' early experiences of attempting and earning credits relate to their longer-term success?

Goal/Purpose

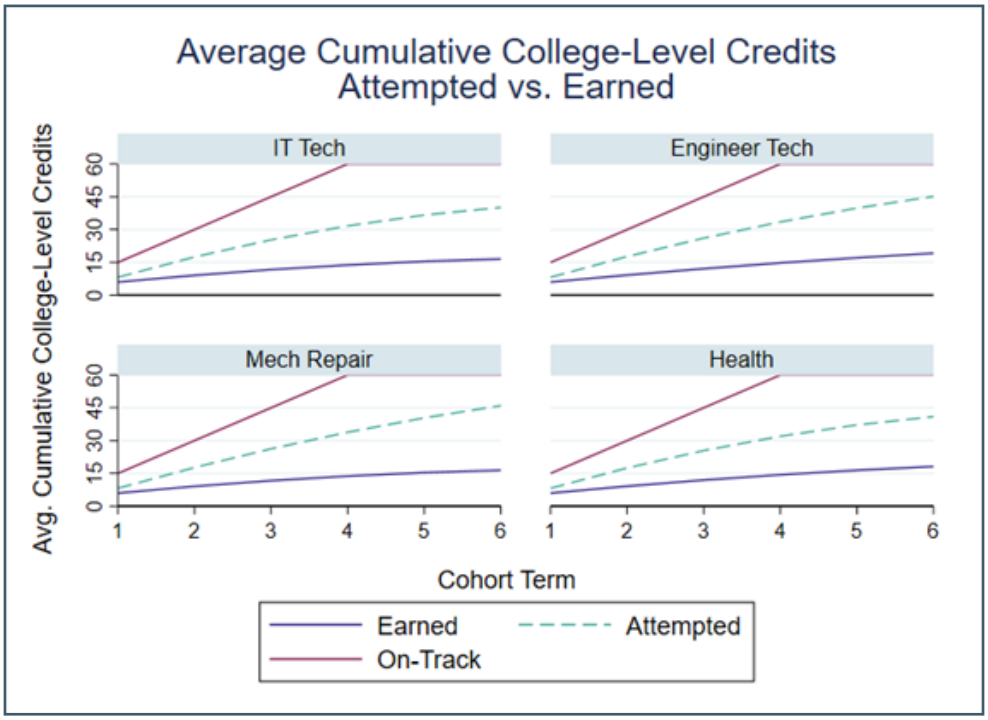
In the final section this Diagnostic, we dive into analyses that will help your institution better understand students' momentum in their chosen pathway over time. For example, if your institution notices that completion rates are lower than desired, you may wonder whether the problem is that students are exiting the program completely or that students are accumulating credits slowly and are not able to fulfill credential requirements in a timely manner. This section prompts you to create three visualizations related to credit accumulation and early momentum. The first visualization shows average college-level credits attempted and accumulated in each term across pathways to highlight whether students are attempting and accumulating credits at a pace that will allow them to complete a credential within a desired timeframe. By juxtaposing credits attempted and earned, this analysis will also help you identify whether the challenge seems to be one of encouraging students to enroll in more courses or helping students to succeed in those classes. The second visualization shows how students' trajectories vary by students' momentum in their first term. This shows the potential importance of students' success early in their academic career for their continued progress. Finally, the third visualization shows the relationship between the number of credits earned in students' first semester and success outcomes after six terms. This analysis serves to further illustrate the importance of early momentum and can help you identify terms when it is critical to provide students with additional academic support to maintain their progress. As with all the analyses in this Diagnostic, you may want adapt the timeframes and success outcomes examined in this section to make them relevant to your context.

Reading for Context

- Belfield, Jenkins, & Fink (2019). Early momentum metrics: Leading indicators for community college improvement. https://ccrc.tc.columbia.edu/media/k2/attachments/early-momentum-metrics-leading-indicators.pdf

In the first visualization of this section, we show the average number of credits attempted and earned by students in a given pathway. This analysis is helpful if you notice that your institution has low success rates but are not sure whether the barrier to success is students not enrolling in enough courses or students not passing their courses and accumulating credits. You can see from these line graphs if the slope of the 'credits attempted' line is steep enough to allow students to earn a credential within a given timeframe (for example, whether students are on pace to attempt 60 credits by the end of their sixth term) as well as to see the difference between the number of college-level credits students are attempting and the number of college-level credits students are earning. As the gap between the two lines grows, the more you may think that the challenge for your institution is providing adequate academic support so that students can pass their courses. If the 'credits attempted' line is flat or not steep enough to reach a given threshold for a credential, your institution may want to examine what information and guidance students are receiving about graduation requirements and recommended credit loads per term.

Example Visualization 4.1: On average, are students attempting and earning credits at a pace necessary to complete a credential in a reasonable timeframe?

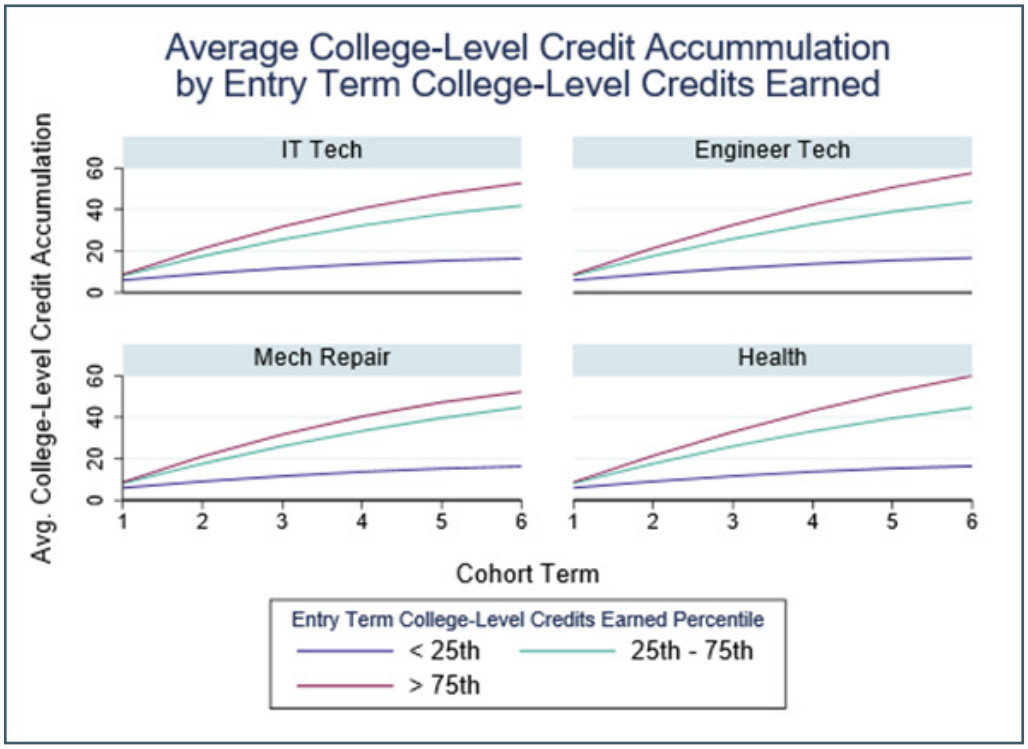


Understanding the Chart

This chart shows that, across pathways, students are not attempting or accumulating credits at a pace that would allow them to complete an associate degree within two years, even though we saw in Section 1 that most students are pursuing an associate degree. The top line in each of the plots shows the pace at which students need to accumulate credits in order to complete an associate degree in two years; the dotted line shows how many credits student are attempting, on average, and the bottom line shows average credit accumulation. Looking at Health, for example, we see that students are attempting enough credits to be able to earn an associate degree in three years, but that credit accumulation is much slower. This suggests that the pathway may want to consider offering additional academic support to help students earn credits in the courses they attempt.

In the second visualization, we examine the importance of early momentum for longer-term credit accumulation. This visualization shows differences in the pace of college-level credit accumulation across students based on how many college-level credits they earned in their first term. The closer the lines are to each other, the less consequential early credit accumulation would seem to be. This type of analysis can help highlight whether students who accumulate few college-level credits in their first term may need additional support to reach a successful outcome.

Example Visualization 4.2: How do students' trajectories of college-level credit accumulation vary by their initial college-level credit accumulation?

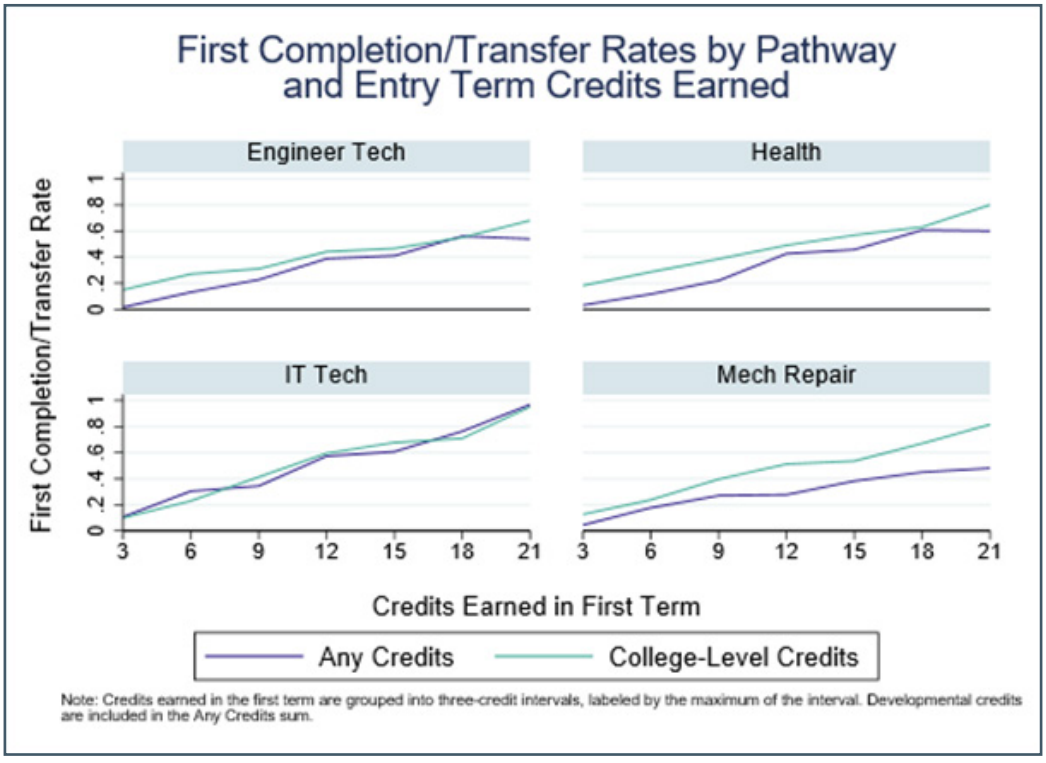


Understanding the Chart

This chart demonstrates the importance of early credit accumulation for students' trajectories over their first six terms. For all pathways examined, we see that students who earned the most credits in their first semester have much steeper rates of credit accumulation throughout their first three years than students who earned fewer credits in their first term. We see only small differences between students in above the 75th percentile of credit accumulation and students between the 25th and 75th percentiles, indicating that students do not necessarily need to earn as many credits as possible in their first term, but should experience some early success in their courses.

In the third and final visualization of this section, we plot the share of students who experience a successful outcome within six terms of entering a pathway against the number of credits they earned in their first term. This analysis can highlight the importance of early momentum in predicting longer-term success and help institutions identify whether they might want to provide additional support to students who earn a limited number of credits in their first term.

Example Visualization 4.3: How does students' success in their first semester predict their longer-term success?



Understanding the Chart

This chart highlights the importance of early credit accumulation in predicting longer-term credential completion. Across all pathways, we see that students who earn more credits in their first term are more likely to complete within six terms than students who earn fewer credits. For example, in the Mech Repair program shown in the bottom right panel, almost 60% of students who earn 12 college-level credits in their first semester complete a credential within six terms, compared to roughly 15% of students who earned 3 credits in their first term. While earning college-level credits is most strongly related to credential completion, earning any credits (including developmental) is positively correlated with three-year completion rates in all pathways.

Reflections and Limitations

As with all the analyses in this Diagnostic, these analyses are descriptive, not causal. They should not be interpreted simply to mean that, for example, instruction is better in one pathway than another, allowing students in that pathway to accumulate credits at a faster rate. More specifically, you may notice that there are large gaps between average number of credits attempted and earned by students in a particular pathway, as shown in Chart 4.2. These patterns do not necessarily mean that Mech Repair instruction is better than Health instruction. Instead, they should be used to help guide discussions and further inquiry at your institution or system to understand what is leading to course failure and what curricular or co-curricular supports may be effective at supporting students in that pathway.

Discussion questions for institutional teams:

1. Are students accumulating credits at the rate your institution would like? If not, is the gap related to attempting credits or earning credits attempted?
2. What sort of advising do students receive around how many credits to take per term?
3. What academic supports are offered on campus? How many students utilize these resources?
4. What relationship do you see between credit accumulation in students' first term and their longer-term success? Is this relationship stronger or weaker than you would have predicted?
5. Are additional academic support services offered to students when they first enroll? What kinds of support?
6. What hypotheses do you have about how your institution could help students accumulate credits at the rate necessary to complete a credential within the timeframe you would hope them to?

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