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A Strategy for Estimating the Effects of Whole-College Guided Pathways Reforms in Community Colleges

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Abstract

Approximately 450 community colleges nationally are part of formal statewide or national initiatives to implement guided pathways reforms to improve student success, and many other colleges are implementing guided pathways practices on their own. Because guided pathways is a whole-college reform—and because it takes several years to fully implement—it is challenging to evaluate. This paper presents a methodology for assessing the scale of adoption and estimating the causal effects of guided pathways within states and across colleges that have adopted the approach. To measure the scale of adoption of guided pathways practices, we will conduct institutional surveys and phone interviews with college leaders and examine the websites of every community college in Ohio, Tennessee, and Washington (70 institutions total). We plan to use these data to estimate each college's scale of adoption using a rubric with indicators for scale and timing. Drawing on strategies used in K-12 whole-school reform evaluations, we propose to examine pre-reform adoption trends and apply a single interrupted time series design to project what students' early outcomes would have been in the absence of guided pathways. We then propose to use a comparative interrupted time series design (which closely resembles a difference-in-differences approach) to exploit variation in the intensity of guided pathways practices and the timing of their adoption across colleges by comparing early student outcomes in colleges that have adopted guided pathways practices at scale and those that have not or those with a low scale of adoption.

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1. Introduction

Over the last two decades, community colleges have engaged in numerous reforms to improve student success. These reforms have been undertaken at various scales, ranging from targeted interventions to college-wide reforms, and have involved different actors within colleges and with outside intermediary organizations. Reforms have also ranged widely in their focus, including large-scale changes to developmental education, transfer articulation, and online education; wraparound services and incentives to promote full-time enrollment; pedagogical and curricular reforms; and college-wide use of data to develop, scale, and assess interventions (Dougherty et al., 2017; Jordan & Picciano, 2020).

In recent years, guided pathways has become one of the most widespread reform models in community colleges across the country, with an estimated 450 community colleges involved in national or statewide initiatives to support its implementation (Jenkins et al., 2021). Guided pathways reforms aim to improve both the quality of community college programs and the ways in which students enter and navigate through them toward credential completion, employment, and further education. The guided pathways framework involves changes to program design, career and academic advising and other student supports, course scheduling, and teaching and learning. These changes, when adopted at scale for all students, are intended to create the conditions for students' success in community college, further education, and work by enhancing program quality, removing barriers to progress, and strengthening support and guidance.

The guided pathways movement is sufficiently mature for us to ask whether there is evidence of improved outcomes at institutions that have adopted the framework. In this paper, we outline a strategy for assessing the scale of adoption of guided pathways and estimating its causal effects on student outcomes. We propose a mixed-methods approach that integrates scale-of-adoption data and student administrative record data from three states that have sought to implement guided pathways throughout their community college systems: Ohio, Tennessee, and Washington. To measure the scale of adoption, we will conduct institutional surveys and phone interviews with college leaders and examine the websites of every community college in these three states and every technical college in Ohio and Washington (70 institutions total). To measure the effects on student

outcomes, we will make use of student unit record data for all students enrolled at these institutions over a 10-year period. Using an interrupted time series analysis, we will make comparisons within and across institutions before and after guided pathways was introduced to determine if there are significant changes in student outcomes that can be attributed to the reforms. We will take a broad view and look at students' general progress in community colleges, including year-to-year persistence, completion of program gateway courses, and total college credits earned.[1]

The COVID-19 pandemic has had large impacts on community colleges and their students and has likely affected colleges' implementation of guided pathways reforms and students' experience of guided pathways practices and outcomes in unknown ways. We began developing our evaluation strategy before the pandemic, and it does not attempt to estimate the effects of COVID-19 on guided pathways adoption and outcomes. For this reason, we will focus on estimating the effects of guided pathways adoption on first-year outcomes for cohorts that entered college prior to the pandemic, through fall 2018.

The paper proceeds as follows. In the second section, we provide background information on guided pathways reforms and explain our motivation for assessing their effects. Then, we lay out the methodological challenges and lessons from prior literature that inform our evaluation approach. In the third section, we present our strategy for evaluating guided pathways reforms, including our approaches to estimating scale of adoption, using administrative data to construct outcomes, and identifying a methodological approach for evaluation. The fourth section provides a conclusion.

2. Background and Relevant Literature

To evaluate a complex, whole-college reform like guided pathways, it is necessary to understand the reform model and how it is thought to affect students' experiences and outcomes. In this section, we describe the guided pathways model's theory of change, our motivations for the study and the challenges involved in evaluating

[1] The evaluation is funded by a grant from the National Science Foundation, so we will also look at changes in students' enrollment and progression in science, technology, engineering, and mathematics (STEM) programs, though our STEM focus is not discussed in this paper.

guided pathways reforms, and methodological considerations from prior literature on measuring whole-college and K-12 whole-school reforms.

2.1 Guided Pathways Theory of Change

Guided pathways is a whole-college reform that aims to help students choose, enter, progress through, and complete community college programs that enable them to secure sustaining-wage employment or transfer with junior standing in a major—and to do so at an affordable cost and in a reasonable timeframe. The reform consists of multiple interconnected changes in practice undertaken in a coordinated manner across the college and scaled to reach all students. Colleges implement guided pathways reforms over several years in varied sequences and intensity depending on their local contexts, resources, and priorities.

Guided pathways reforms intend to address several organizational features of community colleges that create barriers to program entry and success. First, paths to associate degrees, employment, and baccalaureate transfer are generally not clearly mapped out for students, so even students who know which program they want to complete may have difficulty figuring out which courses to take and in what sequence to achieve their goals (Jaggars & Fletcher, 2014). Second, entering students are not consistently helped to explore career and education options (Deil-Amen & Rosenbaum, 2003; Karp, 2013) and connect with faculty, students, alumni, and employers in fields of interest to them. Instead of being helped to explore a field of interest, most entering community college students are referred to remedial coursework, especially in math (Bailey et al., 2010; Rutschow et al., 2019), delaying their access to college-level courses that are critical for many programs. Third, since many students take developmental education and general education survey courses in their early terms, they are not encountering engaging courses in topics of interest (and ideally, in their intended program area), which research suggests improves student persistence, even in challenging fields such as STEM (Wang, 2020). Fourth, many students are not helped to develop an academic plan, and their progress is not monitored (Center for Community College Student Engagement, 2018). Consequently, too many students meander through their studies, earning credits that do not count toward their intended degree; transfer to a four-

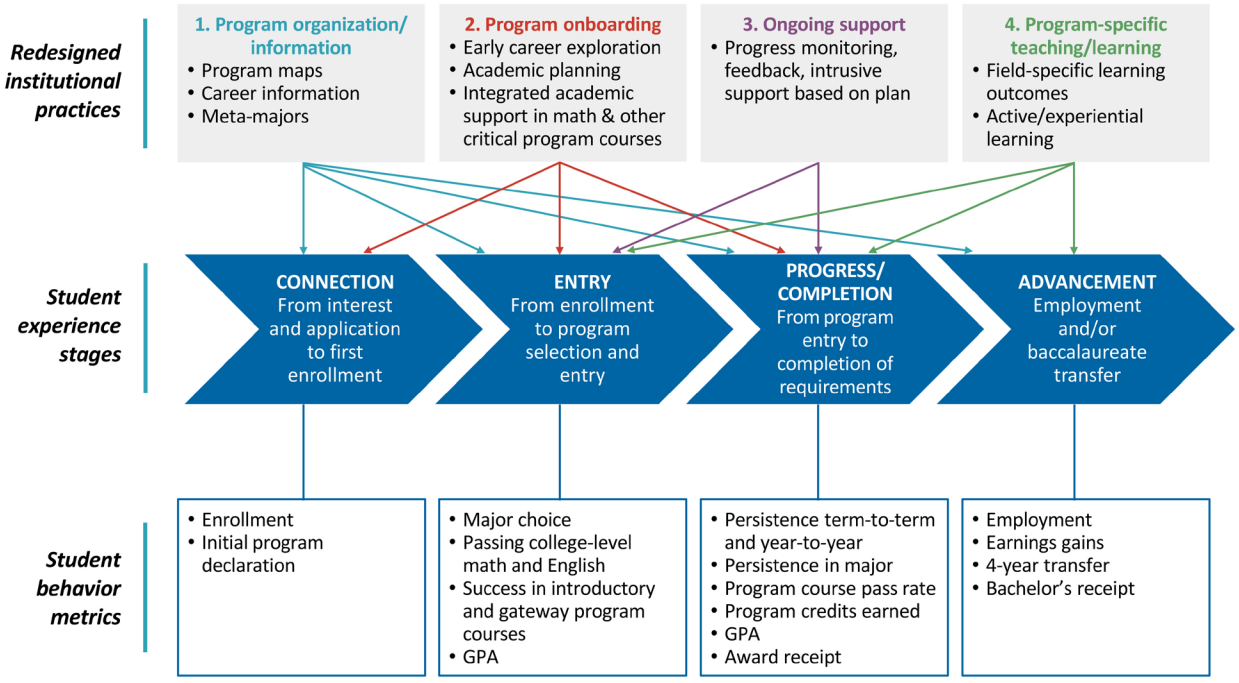
year college without earning a community college credential; or leave college entirely (Fink et al., 2018).

To reduce these barriers to student success, community colleges are redesigning their programs, student supports, and teaching approaches following the guided pathways model, which has four areas of practice:

- *clarifying paths to student end goals* by backward-mapping all programs to ensure they prepare students for direct entry into sustaining-wage employment and further education;
- *helping students get on a program path* by redesigning new student onboarding so that all students actively explore their options and interests, take program-relevant courses, connect with faculty and students in an academic and career community, and develop a full-program educational plan in their first term;
- *keeping students on path* by scheduling classes and monitoring students' progress based on their plans to ensure timely and affordable program completion; and
- *ensuring that students are learning across programs* by strengthening active and experiential learning to build students' confidence as learners and help them develop communication skills, problem-solving skills, and other competencies required to advance to sustaining-wage employment and further education.

Redesigning college practices under each of these areas may help improve community college students' enrollment in and completion of undergraduate programs. Figure 1 presents the guided pathways theory of change across the four areas of practice.

Figure 1.
Guided Pathways Theory of Change



Redesigned institutional practices (top panel) may result in changes in the student experience at different stages in the journey through college (middle panel) and lead to measurable changes in student behavior (bottom panel). For example, the introduction of clear program maps (top panel, Box 1) and career exploration (top panel, Box 2) at the *connection* and *entry* stages may increase the percentage of students who choose a major suited to their interests and aptitudes. Integration of academic support and active learning (top panel, Boxes 2 and 4) into program gateway courses (such as mathematics and science foundation courses for STEM) may increase students' confidence and motivation to progress to higher-level coursework. And improvements in academic planning and progress monitoring (top panel, Boxes 2 and 3) may lead to changes in students' course-taking patterns that enable them to progress through their program requirements more efficiently, complete an associate degree or other credential, and secure sustaining-wage employment or transfer to a four-year institution.

For the evaluation methodology proposed here, we focus on first-term and first-year academic and program momentum metrics, given that many guided pathways practices focus on students' early experiences and that colleges have relatively recently

adopted guided pathways reforms at scale. Moreover, early academic momentum is strongly correlated with completion and transfer success over the longer term (Belfield et al., 2019; Fink et al., 2021; Jenkins & Bailey, 2017). In light of the premise that multifaceted, complementary changes in practice are needed to support students' learning and success in their programs, we would expect to see changes in incoming students' outcomes after most guided pathways practices have been adopted at scale at a college. Given the complex, multiyear implementation needed to scale guided pathways reforms and the varied sequences and intensity in which individual colleges approach changes to practice, we need detailed information about the reform implementation process at individual colleges to associate practices with student outcomes. Therefore, our evaluation approach includes collecting data on the term and year in which practices were adopted at scale at each college and then identifying the potential effects one might expect those particular practices to have and within what timeframe.

2.2 Motivations and Challenges to Studying Guided Pathways Reforms

Approximately 450 community colleges across the country are part of formal statewide or national initiatives to implement guided pathways, and many other colleges are implementing guided pathways practices on their own (Jenkins et al., 2021). Guided pathways reforms have been studied descriptively (Jenkins et al., 2018; Jenkins et al., 2019; Jenkins et al., 2017a, 2017b; Klempin & Lahr, 2021a, 2021b; Konruff, 2020; Schanker, 2019; Schanker & Orians, 2018), and colleges' implementation has been recorded in case studies (Career Ladders Project, 2019; Michigan Center for Student Success, 2019; Waugh, 2016), but the reforms have never been formally evaluated. We have three primary motivations for evaluating the effects of guided pathways.

First, an evaluation will help us and the field understand whether guided pathways reforms work, for whom, and in which circumstances. Second, this evaluation will allow us to test a key premise of the guided pathways model: that colleges need to redesign programs, practices, and policies in a complementary fashion and at scale—for all students and across all programs—to meaningfully improve student outcomes (Bailey et al., 2015; Bryk et al., 2010; Kuh et al., 2005). Third, since colleges adopt guided pathways practices at their own pace and in varied sequences, we are interested to learn more about how variations in the timing, sequence, and scaling of guided pathways

practices may influence the reform's effects. The results will help to refine the guided pathways theory of change and indicate whether further development and testing are warranted (IES & NSF, 2013).

Because guided pathways is a whole-college reform—meaning it is designed to be implemented for all students in all programs of study at a given college—it also presents some evaluation challenges. Most important, it is not possible to create a comparison group of students within a college that does not experience guided pathways. In theory, we could randomly assign whole institutions to a group that adopts guided pathways practices at scale or to a comparison group that does not, but this is not feasible in states like Ohio, Tennessee, and Washington that have made decisions at the system level to implement guided pathways at all of their community colleges.

Another evaluation challenge is that guided pathways has been conceived and communicated as a framework or set of principles for colleges to follow. Guided pathways is not a highly specified intervention or treatment; it does not come with a curriculum or set of products that can be analyzed for fidelity of implementation. Rather, colleges are expected to adapt guided pathways to their local context. Moreover, because colleges implement guided pathways reforms at their own pace and in varied sequences, implementation is a process rather than a clearly demarcated event. Indeed, CCRC has found that colleges often take several years to implement guided pathways reforms at scale (Jenkins et al., 2021; Jenkins et al., 2019).

Finally, guided pathways reforms are rarely implemented in isolation. Many of the states and colleges that are adopting guided pathways reforms are undertaking other student success initiatives, such as reforms to developmental education and transfer articulation. These reforms may overlap and interact with guided pathways. Therefore, it is important to understand the institutional setting for the analysis and be cautious when drawing conclusions about the impact of guided pathways.

CCRC is well positioned to study guided pathways reforms, given the reforms' development by researchers at our center and our extensive interactions with community colleges. Since the model was outlined in *Redesigning America's Community Colleges* (Bailey et al., 2015), CCRC has been conducting research to inform the work of individual colleges and state systems that are adopting or considering guided pathways reforms

(Jenkins et al., 2021). The evaluation approach described in the current paper draws upon extensive qualitative data on 116 colleges' implementation of the guided pathways model, collected over multiple years. This line of research includes the 70 colleges in Ohio, Tennessee, and Washington that will be included in our application of this evaluation approach, as well as 20 colleges in California and 26 colleges in 14 states that participated in the American Association of Community Colleges' (AACC) Pathways Project.

However, we recognize that our connection to guided pathways means that we risk being too close to the reform and its success. Borman et al. (2003) call attention to potential biases in K-12 comprehensive school reform research in which the reform developers are also the evaluators. Their meta-analysis shows that developer-evaluator research tends to find more positive impacts resulting from the reforms than third-party evaluations. Many of the reform developers were venture capitalists who stood to benefit directly from the implementation of their reforms, whereas our connection to guided pathways reforms is more indirect in that it is not a reform package sold to colleges. Still, we need to be transparent about our assumptions, hypotheses, methods, findings, and limitations and encourage third-party evaluations of guided pathways in the future.

2.3 Methodological Considerations From Prior Literature

While discrete practices that are components of guided pathways reforms have been studied, we know of few comparable evaluations of whole-college reforms—and in particular, evaluations of colleges implementing not just new practices but also new or adapted business processes and information systems. Therefore, in designing this methodology, we drew on evaluations of K-12 whole-school reforms in addition to the postsecondary reform literature. Below, we examine methodological lessons from an evaluation of a large-scale reform in higher education and relevant evaluations of K-12 whole-school reforms. Then, we discuss how the literature informs our approach to estimating scale of adoption, using data on early student outcomes, and identifying a methodological approach for evaluation.

The Achieving the Dream: Community Colleges Count Evaluation

Launched in 2004, Achieving the Dream: Community Colleges Count aimed to help 26 community colleges develop an institutional culture that fostered the use of

student data to inform college-wide strategies to improve students' academic success (Mayer et al., 2014; Rutschow et al., 2011). The evaluation of this initiative demonstrates some of the challenges of developing a causal research design to examine the extent to which the initiative affected student outcomes and the challenges of collecting adequate data on whole-college implementation and scaling.

MDRC and CCRC researchers conducted an evaluation of the initiative, but the analysis of student outcome trends was descriptive rather than causal. Researchers looked at trends in student outcomes three years prior to implementation and three years after the start of implementation, and each student cohort's outcomes were examined for two years from initial enrollment to see if there were any improvements on key measures after colleges implemented their strategies related to the initiative (Rutschow et al., 2011). Researchers analyzed five outcomes of interest: completion of developmental courses and progress to college-level courses, enrollment in and completion of college-level gatekeeper courses, course completion, term-to-term and year-to-year retention, and completion of certificates and degrees. While most participating colleges were successful in cultivating a "culture of evidence" to understand where and why many students were struggling, researchers found few positive effects of the initiative on student outcome trends. Further, data on student outcomes were collected at the institutional level without additional data on individual students, which prevented researchers from analyzing outcomes for student subgroups, including students who were targeted by their college to participate in specific interventions (since their reforms were small in scale during the study period). The research design also did not include counterfactual measures to understand what would have happened to students in the absence of the initiative. The researchers found it challenging to disentangle the effects of this initiative from other separate grants and initiatives that colleges were undertaking in conjunction with their Achieving the Dream reforms and had to rely upon colleges' self-reported information about which strategies were part of the initiative.

The study also highlights the importance of capturing data on reform implementation and scaling. To measure the scale of implementation of reform strategies for this initiative, college personnel were asked to estimate the number of students reached by a strategy in a given term, as well as the total target population. In their

analyses, researchers discussed the tradeoffs that many colleges faced between the intensity and scale of their interventions; for example, many high-intensity strategies (reaching students for more than 10 hours per semester) only reached small-scale implementation (reaching less than 10% of the intended target population). Even among lower-intensity strategies, however, few were scaled to reach more than 25% of the target population during the study period. In this regard, the initiative did not represent a whole-college reform in terms of reaching or affecting most students at the colleges, which helped to explain why researchers did not see changes in student outcomes at the institutional level.

Evaluations of K-12 Whole-School Reforms

Given the dearth of whole-college reform evaluations, in developing our evaluation strategy, we also drew on evaluations of whole-school and comprehensive school reforms undertaken in public K-12 contexts in the 1990s and 2000s. Some of these reforms have similar features to guided pathways, and the evaluations faced similar methodological challenges.

In both whole-school and guided pathways reforms, the institution itself is the unit of implementation and has significant flexibility to decide how to implement reforms based on the design principles of the models. Both types of reforms originated from the theory that coordinated, institution-wide reforms that address multiple aspects of students' experience and school operations—rather than discrete or piecemeal interventions focused on a narrow aspect of students' education—better serve all students, including students who are underperforming (Bifulco et al., 2003). Schoolwide reforms like the Comprehensive School Reform Program[2] typically use evidence-based practice in their design, with changes to instruction, curriculum, and governance; extensive and ongoing professional development; facilitators in the building to help manage the reform process; measurable goals and benchmarks for student achievement; and parent and community involvement (CSRQ Center, 2006). In most cases, adoption of

[2] The Comprehensive School Reform Program was administered by the U.S. Department of Education's Office of Elementary and Secondary Education first as a demonstration program (1998) and later as a full program (2002) as part of the No Child Left Behind Act. "Between 1998 and 2006, nearly 7,000 schools nationwide received three-year awards to implement CSR models" (Orland et al., 2010, p. 1). The program's goal was for schools to improve all aspects of their operations (in a comprehensive manner) through the implementation of evidence-based reform models.

the reform model is not legislatively mandated, and school staff have significant latitude to combine reform practices in various ways.

Whole-school reform researchers have found that the success of a reform often hinges on the quality of its implementation, which can be difficult to estimate; the fidelity of implementation, with more clearly defined reforms tending to be implemented with greater fidelity; the provision of adequate training, professional development, and follow-up to address ongoing and evolving implementation challenges; and substantial understanding of the reform and buy-in or co-construction by teachers and administrators (Borman et al., 2003). Additionally, researchers of whole-school reforms and guided pathways have emphasized the challenge of redesigning practices at scale and sustaining whole-institution reforms (Bryk et al., 2010; Jenkins et al., 2019). Beyond the challenges involved in effecting within-institution change, school leaders and staff often face the need for change beyond the school itself and experience difficulty in influencing structural changes in other organizations and institutions (for whole-school reforms, at the district and state levels; for guided pathways reforms, at the college system and state levels, with four-year and employer partners, and in terms of local, state, and federal funding) (Gambone et al., 2002, p. 6).

In many whole-school reform evaluations, researchers have had difficulty estimating the quality of reform implementation. Borman et al.'s (2003) meta-analysis of 232 evaluations of 29 widely implemented comprehensive school reform models notes that few studies documented the quality of the models' implementation and that this represents one of the most significant deficits in the comprehensive school reform research literature. In addition, some effects were not well explained by the reforms themselves, suggesting that the "differences in the effectiveness of CSR [comprehensive school reform] are largely due to unmeasured program-specific and school-specific differences in implementation" (p. 166). A related issue (and one that emerged in the Achieving the Dream study discussed above) is that researchers sometimes have to ascertain whether a lack of positive impacts in whole-school reform evaluations is due to a failure in the model itself or a failure of schools to implement the model as intended and at scale. In an evaluation of the New American Schools comprehensive school reform, Berends et al. (2002) found greater implementation variation within schools than between schools,

suggesting that, in most cases, the model was not implemented schoolwide and therefore had not reached scale. Bryk et al.'s (2010) study of whole-school improvement efforts at over 200 Chicago public elementary schools may be one of few to overcome the above-noted issues. Those researchers were able to collect extensive longitudinal data—in particular, detailed survey data from principals, students, and teachers at Chicago Public Schools—that informed their assessments of the quality of reform implementation.

Another critical issue in evaluating whole-school reforms when randomized experiments are not feasible is the construction of a valid counterfactual. Bloom et al. (2001) introduced an approach based on a single interrupted time series (SITS) analysis to evaluate the impact of the Accelerated Schools reform model on third-grade test scores, using a sample of schools that had adopted the reform in the early to mid-1990s. This strategy relies on the assumption that if the school reform had not been implemented, average student performance during the follow-up period would have remained at pre-reform baseline levels. The researchers estimated counterfactuals of eight school reforms, located in diverse settings across the nation, using a baseline period of three years prior to the reform and a follow-up period of five years because whole-school reforms usually take three to five years to implement. They found that the estimated impacts of the Accelerated Schools reform tracked the course of its implementation, although local factors or events other than the reform could have caused changes in test scores that distorted their impact estimates. Specifically, Bloom et al. found no positive impacts on test scores in the first two years, when schools were focused on reforming school governance and culture, and a gradual increase in the fourth and fifth years as schools implemented curriculum and instruction reforms.

When evaluating whole-school reforms, researchers often recommend quasi-experimental control-group designs that include comparison schools that did not adopt an education reform. In their meta-analysis of comprehensive school reform programs, Borman et al. (2003) found that using time series data from a single group of schools that adopted a reform produced larger effect sizes than using comparison groups. Miller and Mittleman (2012) added a comparison-series design to a SITS analysis for comparison schools that did not adopt a reform to measure the impact of the High Schools That Work (HSTW) framework for school improvement. The comparison schools' deviation from

their baseline performance pattern provided a new estimate of the counterfactual for HSTW schools. This study assessed the framework's effectiveness in increasing success in college preparatory mathematics and science courses using 13 years of data on 18 HSTW schools in North Carolina. The authors selected a control group using a matching process modeled to account for school-level selection bias to the extent that selection occurs on variables that can be observed in the data. Their results show no effect on pipeline progression for the average student and some evidence of increased gaps in course-taking between more advantaged and disadvantaged students.

Overall, the K-12 whole-school reform evaluation literature highlights the importance, for evaluations of whole-college reforms in higher education, of understanding the challenges of implementing whole-college reforms, constructing a valid counterfactual, and considering variations in the implementation of reforms across institutions over time.

3. Strategy for Estimating the Effects of Guided Pathways Reforms

In this section, we detail our proposed approach for evaluating guided pathways reforms.[3] First, we focus on estimating colleges' scale of adoption of guided pathways practices. Then, we outline our methodology for estimating the effects of adoption on early outcomes, explaining how we are constructing outputs and outcomes of interest using student unit record administrative data and applying a SITS design and then a comparative interrupted time series design to evaluate the impact of guided pathways reforms.

3.1 Estimating Scale of Adoption

To estimate each community college's scale of adoption of guided pathways practices, we will use multiple data sources, including survey responses, phone interview data, information from college websites and course catalogs, and selected student transcript data. We describe these data sources below and then explain how we will use them to estimate the scale of adoption and develop ratings to inform our impact analysis.

[3] We developed the approach outlined in this paper in consultation with members of our National Science Foundation project advisory board, who have methodological and empirical expertise in evaluating whole-school reforms.

Collecting Data on Scale of Adoption of Guided Pathways Practices

Guided Pathways Scale of Adoption survey. Building on prior CCRC research assessing the implementation of guided pathways practices (Lahr, 2018), we developed the Guided Pathways Scale of Adoption (SOA) survey (see the appendix) to ask about changes to college practice that we hypothesize are most critical to implementing guided pathways and most likely (given the theory of change presented earlier) to be associated with improved student outcomes, and that can be measured in terms of scale. Examples include organizing programs by broad field or meta-major; mapping programs to jobs or transfer in a major; academic and career exploration leading to program choice in the first year; full-program educational planning; first-term enrollment in courses of interest; experiential and active learning in introductory program courses; integrated academic support in introductory program courses; proactive monitoring of students' progress on their educational plans by advisors and faculty; and class scheduling based on the courses needed on students' educational plans. Each item includes a brief explanation of the practice and asks which practices the college has adopted at scale (for all or nearly all [more than 80% of] new credit students or programs of study). Respondents are also asked to select the term and year in which the practice was first at scale.

Since the survey asks about a range of activities carried out by different departments, we suggest that it be completed by a small group of college staff and faculty. We provide guidance on the recommended respondents (specifically, that the survey be completed by a group that includes someone who has been at the college for at least five years and has knowledge of the history of the college's reform work) and request the names and job titles of those completing the survey to understand whose input is included in the responses. We explain that survey responses will be used to study how colleges are undertaking and scaling guided pathways, how colleges' scale of adoption of guided pathways practices is related to first-year student momentum, and how guided pathways could be improved. We do not use the word "evaluation" since we are not evaluating the colleges' progress (and do not want to elicit artificially high self-ratings out of concern that we are evaluating their progress) but instead studying the effects of the reform model.

We piloted an early version of the survey with the 13 Tennessee community colleges in January 2020 and a more recent version with one college each in Ohio and

Washington (December 2021) and Tennessee (February 2022). We made minor revisions to the survey based on feedback received during these pilots. In Tennessee, guided pathways work is typically coordinated by the academic affairs division at each college. In most cases, the survey was sent to and submitted by the college's vice president of academic affairs and completed by that individual and a small team of other staff involved in guided pathways implementation. Most colleges in the Tennessee pilot completed the SOA survey in teams of three or four people (range: 1–7). In other states, including Ohio and Washington, colleges may have "guided pathways leads" who coordinate guided pathways implementation and who can request information from the appropriate respondents at their institutions to complete the survey. We acknowledge that there is some risk of bias in relying on self-reports from college staff who are leading the guided pathways work at their colleges, but those staff are typically best positioned to understand the timing and scale of practices' adoption.

Interview data. When we piloted the SOA survey with the Tennessee colleges, we held 75- to 90-minute phone calls with the college guided pathways lead or with a small group of college staff to discuss how practices were implemented and validate their responses. We plan to conduct a similar process with the Ohio, Tennessee, and Washington colleges for our upcoming administration of the survey, though we have refined our protocol to focus on validating survey responses so that we can complete these calls in a half hour.

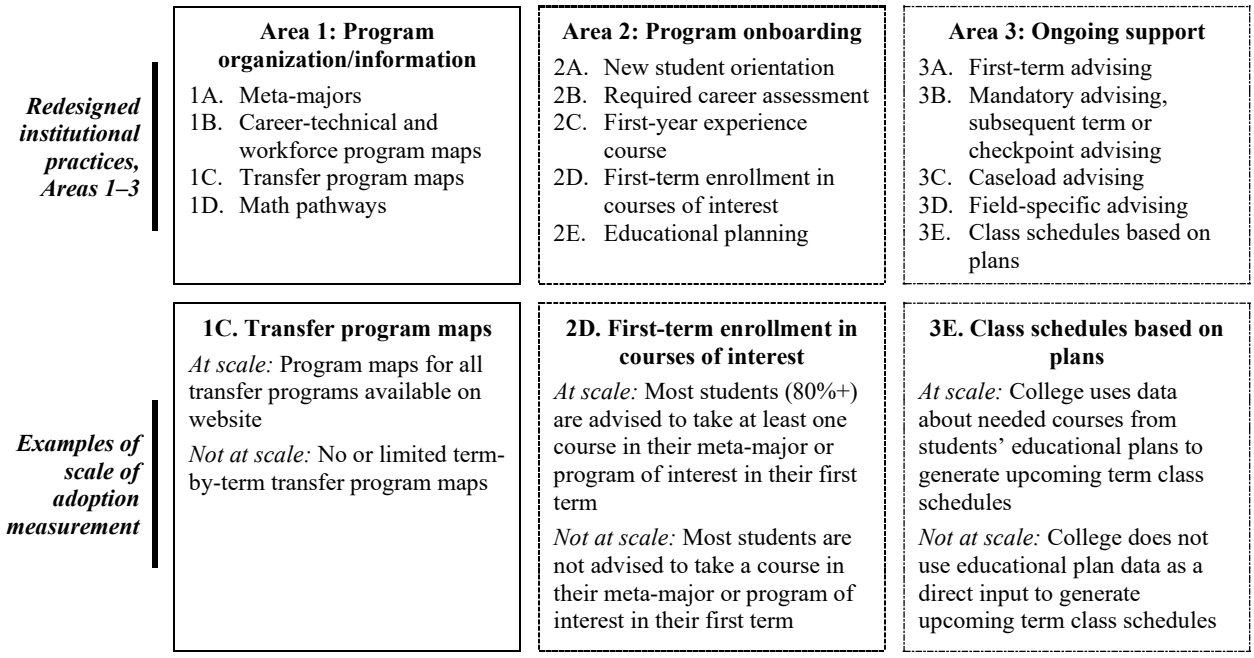
Developing a Rubric to Estimate Colleges' Scale of Adoption of Guided Pathways Practices

We created a rubric to characterize colleges' scale of adoption of guided pathways practices using SOA survey responses, phone interviews, college website analyses, and transcript data to assess and validate scale and timing (Table A1 in the appendix). We will also use data on the year and term that practices reached at-scale adoption to assign adoption scores over time that reflect how many practices each college had adopted at scale at different time points. The rubric will enable us to identify colleges that moved from zero scale of adoption to a low or high scale of adoption. Then we will compare colleges that have not adopted guided pathways at scale with colleges that have some level of adoption; we will also compare colleges that have a low scale of adoption with

those that have a high scale of adoption. This process will enable us to predict for which student cohorts we might expect to see improved outcomes.

We developed a rubric to estimate colleges' scale of adoption for individual guided pathways practices within three areas of the model and across all areas (the treatment intensity). We designed it for use in various states and contexts rather than tailoring it to a particular state or college system. Figure 2 lists the practices within each area for which we are estimating the scale of adoption (14 practices in total; four in Area 1 and five each in Areas 2 and 3) and provides examples of how we are measuring scale of adoption for particular practices: transfer program maps from Area 1, first-term enrollment in courses of interest in Area 2, and class schedules based on plans in Area 3.

Figure 2.
Examples of Scale of Adoption Measurement of Guided Pathways Practices



In creating the rubric, we first identified the discrete guided pathways practices that we would use to evaluate adoption of the model (Column 1). We prioritized practices that are measurable in terms of scale and that we hypothesized would be associated with improved student outcomes, particularly early academic and program momentum metrics. The practices are grouped into three of the four guided pathways practice areas: program organization/information, program onboarding, and ongoing support.

We then identified SOA survey item responses that would serve as indicators of scale and timing (Column 2). We knew from the outset that we would be assessing scale primarily in terms of presence or absence (if a practice has been adopted for all new students or in all programs of study) and would not be able to attend to nuances in implementation quality.

In Column 3 of the rubric, we identify methods for validating the survey responses, which primarily include phone interviews and researcher review and assessment of college websites, college catalogs, and transcript data. By reviewing the colleges' websites and course catalogs, researchers can assess the consistency of content across program maps and web pages and verify the presence of meta-major structures, math pathways, and integrated academic support models. Since we have access to administrative data from all three states in this project, we can examine transcript data on first-time-ever-in-college (FTEIC) students' enrollment in college-level courses in their first year to verify and learn more about the uptake and scaling of guided pathways practices. For example, we can use transcript data to examine participation in first-year experience or student success courses to measure the uptake of student onboarding practices. For each of these validation methods, we have processes in place to record our observations, note instances in which respondents' assessment of the scale of adoption of a given practice differs from CCRC researchers' assessment, and follow up with college staff to request additional information if needed.

After validating college survey responses, we will rate adoption for each practice on a 0 to 1 scale, with most practices including criteria for 0 (not at scale) and 1 (at scale) scores. A few practices include criteria for a score of .5; these practices contain multiple parts, which are asked about in separate survey questions (e.g., meta-major structure is used in onboarding and meta-major structure is present on website). If a college has adopted one but not all parts of a practice at scale, it would be assigned a .5 score. In primarily using the 0–1 scale, we can more clearly assign points to colleges that have adopted a given practice at scale and assign no points to colleges that have not yet reached scale. This scale weights all practices equally, as all practices are essential for the theory of change.

While piloting the rubric with the Tennessee colleges, CCRC researchers discussed questions about criteria for at-scale adoption to clarify the rubric scoring text,

improve consistency, and strengthen interrater reliability. We were aware that, since many guided pathways practices were implemented and scaled system-wide in Tennessee, we may have difficulty identifying a wide enough range of variation in adoption to form low, medium, and high scale of adoption cohorts to compare colleges in that state. This challenge makes careful application of the rubric even more important.

Using the Rubric to Estimate the Scale of Adoption of Guided Pathways Reforms

We will use the rubric to assess the scale of adoption of guided pathways practices for each community college and group colleges into cohorts (i.e., low, medium, and high adoption) or quartiles in the distribution of adoption for our quantitative analyses. We will also graphically present the timing of scaled practices for each community college.

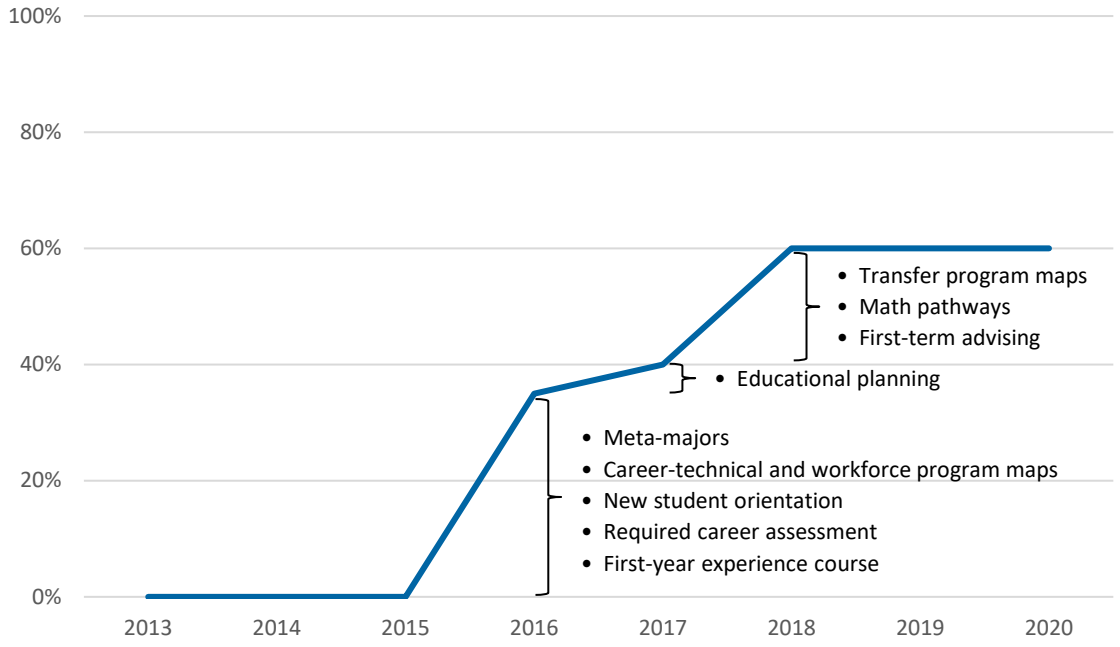
Estimating each college's scale of adoption. We will use the rubric and review data for all colleges in the evaluation, practice by practice. When scoring is complete, we will add each college's area totals and overall score and create quartiles of adoption or low, medium, and high adoption cohorts based on overall scores. These cohorts will be used to conduct subgroup analyses, as described below. We will complete the college adoption scoring process before we begin our analysis of student outcomes. Table A2 in the appendix details the scores for three sample colleges at the time of the survey pilot (December 2021 and February 2022) and illustrates the degree to which scale of adoption of guided pathways practices can vary across institutions.

Comparing colleges within the same state. We piloted components of this evaluation methodology within one state (Tennessee) and will continue to compare colleges within the same state when we carry out the evaluation. We will examine each state separately so that we do not have to control for inter-state differences in population characteristics and policy regimes. All three states have been implementing guided pathways reforms for several years, with Tennessee community colleges starting to implement these reforms as early as 2014 (Finney et al., 2017; Jenkins et al., 2018; Meehan & Kent, 2020), Ohio colleges starting in 2016 (Jenkins et al., 2017a), and Washington colleges starting in 2016 (Washington State Board for Community and Technical Colleges, 2021). The colleges in these states have also been involved in other concurrent initiatives and reforms that may compete with or reinforce the goals of guided

pathways reforms (e.g., corequisite reforms in Tennessee community colleges and the Tennessee Promise program, a last-dollar scholarship and mentoring program for Tennessee high school graduates to attend community or technical college). Therefore, we will examine policy conditions and initiatives in each state that might have coincided with guided pathways implementation. Below, we describe how we will estimate the scale of guided pathways adoption amid other reform efforts.

Incorporating at-scale timing data with colleges' scale of adoption. The SOA survey requests timing information (term and year) for each practice adopted at scale so that we can estimate when (and for which student cohorts) we might expect to see associated improvements in quantitative measures from that practice in combination with other practices adopted by that point. Figure 3 illustrates a sample college's timing of scaled practices by year. The brackets provide detail on the specific practices adopted at scale in 2016, 2017, and 2018.

Figure 3.
Sample College B's Percentage of Guided Pathways Practices Adopted at Scale by Year



In our example, first-time credit students at Sample College B did not experience guided pathways practices adopted at scale before 2016. The college either did not have

any practices in place or had adopted some practices but not at scale (meaning that these practices were not accessible or available to at least 80% of first-time students). In 2016, all or nearly all (at least 80%) of first-time students at Sample College B were experiencing five practices that had been adopted at scale that year, representing 35% of the total of 14 practices. The college adopted one additional practice at scale in 2017 and three additional practices at scale in 2018, which then represented 60% of the total. As we discuss later, we will use this variable that indicates the level or percentage of guided pathways practices adopted at scale to measure scale of adoption and generate categories of adoption or quartiles in the distribution of adoption. If all other colleges in the same state as Sample College B adopted fewer than 60% of the practices at scale by 2018, then Sample College B would be placed in the high adoption cohort or in quartile 4 (i.e., among colleges that adopted the most guided pathways practices).

For our application of the rubric with the Tennessee colleges, we calculated the total scores for each college based on practices adopted at scale by fall 2019. Most colleges had adopted most practices between 2015 and 2017 or 2018, so we hypothesized that at least one or two cohorts of students would have experienced those changes by fall 2019. In other state systems in which changes were adopted more recently, it may be more difficult to associate reforms with changes in trends in early college outcomes, and researchers would want to consider whether recently adopted practices would receive full scores in a rubric.

Limitations of This Approach to Estimating the Scale of Adoption of Guided Pathways Practices

In our earlier guided pathways research (Jenkins et al., 2019; Jenkins et al., 2017a; Jenkins et al., 2017b; Lahr, 2018), we developed and used the Guided Pathways Scale of Adoption Assessment (SOAA) to assess colleges' implementation of guided pathways practices. For this study, we significantly revised the Guided Pathways SOAA to create the Guided Pathways SOA survey to develop a tool better suited to evaluating scale of adoption toward a causal analysis. Still, the SOA survey retains some features of the SOAA, and most notably, it relies upon college respondents' self-reported assessments. For some practices, we request evidence to confirm at-scale responses (for example, the percentage of new credit program students from the previous fall who had

full-program educational plans by the end of their first year), but for most practices, we do not request additional evidence (for example, data related to advising and educational planning, such as advisor–student ratio or frequency of advisor/student interactions, though we will continue to explore ways to collect these types of data in ways that are not burdensome to college staff). The self-reported nature of the Guided Pathways SOA survey and its resemblance to the Guided Pathways SOAA may lead respondents to rate themselves highly to elicit favorable reactions from college or state leadership. In instances in which our descriptions of at-scale adoption are not clear to college respondents (and for practices for which we cannot obtain additional confirmatory evidence), we are likely to have inconsistent application of the at-scale designation and instances in which practices are not actually at scale by our quantity-focused definition of all or nearly all new credit students or programs.

Additionally, it can be difficult to estimate when and whether practices are at scale college-wide when they are being adopted at the program or meta-major level because of expected variation in how departments carry out their work. This presents particular challenges for practices in Area 4 of the guided pathways model (ensuring students are learning), so an institution-focused survey is likely to be insufficient to estimate each practice's scale of adoption across multiple programs and meta-majors. To understand faculty members' improvement of instruction and use of active and experiential learning in introductory program courses across a college, we would likely need to interview faculty from multiple departments to make more accurate determinations of scale, which is not feasible for a large-scale evaluation (70 colleges across Ohio, Tennessee, and Washington). Therefore, the Guided Pathways SOA survey is not well suited to estimating classroom and department-level practices with accuracy. While the survey is better suited for evaluation than the SOAA, it still may not be sensitive enough to evaluate guided pathways adoption in terms of impacts that would be experienced in college classrooms.

We will use phone interviews to discuss colleges' adoption of guided pathways practices and the degree to which all entering students or all programs are affected by them. For some practices, we may not be speaking with a respondent who is well positioned to know how many students or programs are affected by practices that are

carried out by multiple departments, even if they are knowledgeable about the college's overall efforts to implement guided pathways. We frequently speak with vice presidents, presidents, and deans of colleges and speak with faculty and advisors less often. For this reason, we are encouraging colleges to have multiple respondents complete the survey and have worked to phrase survey items as clearly as possible to elicit accurate responses.

In instances in which researchers are assessing scale of adoption from college websites and course catalogs, we acknowledge that colleges are undertaking work that is not always prominently displayed on websites, particularly within courses, so this vantage point can limit what we can learn about college practices.

Limitations of the Rubric Scoring System

The rubric weights all practices equally (we do not assign a greater weight for practices that we hypothesize may be more associated with improving student outcomes than others), and the number of practices varies within each area and does not correspond with the area's relative association with improved student outcomes. Areas 2 and 3 have five practices each, and Area 1 has four practices, but that does not mean that Areas 2 and 3 are necessarily more associated with or more likely to improve student outcomes. In further development of the rubric, we are interested in understanding how particular sets of guided pathways practices (when adopted together at scale) might be associated with improved early student outcomes and then assigning greater weight to those practices.

Further, the rubric attends more to scale than to quality. Simply adding together points for practices adopted at scale and determining each college's total score does not fully capture how guided pathways practices adopted across the college, in interconnected and complementary ways, in a high-quality manner, and developed and refined over multiple years, are associated with improved student outcomes. In addition, the rubric does not attend to the combinations of practices adopted or the sequence of practices adopted. In future research, we would be interested in developing a more nuanced scoring process to address the interconnected and sequential nature of changes in practice and the quality of implementation.

3.2 Estimating the Effects of Adoption on Early Student Outcomes

Constructing Outcomes of Interest Using Student Unit Record Data

We intend to identify and construct outcomes of interest that we expect would be associated with guided pathways practices adopted at scale by using student unit record administrative data. As discussed previously, measures of progression and completion typically used to evaluate the effectiveness of higher education reforms, such as graduation, transfer, and employment outcomes, may offer a general sense of how students are performing and whether institutions are providing adequate support to enable their success. However, these measures may not capture particular components of guided pathways reforms or may require a longer tracking period (3–6+ years[4]) to discern improvements than is available for colleges that have adopted guided pathways reforms at scale in the last two or three years, therefore making them insufficient for our evaluation.

Since the evaluation of Achieving the Dream: Community Colleges Count, researchers have identified better measures of student success in community colleges, including one-year momentum metrics that are predictive of longer term outcomes such as graduation and transfer (Belfield et al., 2019). Because whole-college reforms like guided pathways can take as long as five to seven years to implement (Jenkins et al., 2019), it is important to include metrics that can be measured each year so that researchers can identify changes in outcomes over time that may correlate with changes in practice. Furthermore, recent research from CCRC shows that increasing students' early momentum is associated with stronger benefits in terms of transfer and bachelor's degree attainment for Black and Hispanic students than for White students (Lin et al., 2020), so early momentum metrics may provide important evidence on colleges' success in reducing educational inequity.

We are interested in measuring the effects of guided pathways practices on early student outcomes. We predict that multiple guided pathways practices—namely, onboarding practices focused on academic and career exploration, program mapping,

[4] Associate and bachelor's degree completion may be associated with guided pathways practices adopted at scale. Completion rates are based on the measure of full-time degree-seeking students who complete their degree program within 150% of the normal time for completion (e.g., within three years for students seeking an associate degree and within six years for students seeking a bachelor's degree).

educational planning, and advising reforms—when adopted at scale, would support students to make an informed program choice early on, develop an individualized educational plan detailing their course requirements term by term to completion, and have their progress monitored along their plan. The combination of these practices could result in students' enrollment in greater percentages of program-applicable courses than students who enrolled when these practices were not adopted or had not yet been scaled.

Our first set of outcomes of interest is related to early academic momentum and includes metrics such as first-year credit attainment, first-year credit accumulation in college-level math and English, and first-to-second-semester persistence. Our second set of outcomes, related to program momentum (for transfer to a four-year college), includes first-year major declaration and persistence, along with transferrable and major-specific course-taking and performance in the first year.

Our access to longitudinal administrative datasets from the colleges in Ohio, Tennessee, and Washington allows us to construct these outcomes and disaggregate them by race, income, age, and gender and to measure changes in outcomes over a long period of time. Yet these data suffer from an important limitation. Community college students in Ohio, Tennessee, and Washington have roughly similar demographic and graduation rates compared with the United States but are more likely to be White and less likely to be Asian or Hispanic. Additional research is needed in other states that vary geographically and demographically.

Another substantial limitation is that, for many majors (and in particular for programs that lead to transfer), it is difficult to ascertain community college students' in-progress program intentions through administrative data, with a student's major and credential typically only clear once they have completed their program. One notable challenge in conducting analyses on program momentum concerns how students' program enrollments are classified in many community colleges' transcript data. Typically, colleges assign students a particular CIP (Classification of Instructional Programs) code based on their program enrollment. In most state datasets, transfer-intending community college students pursuing associate of arts (AA) and associate of science (AS) degrees are assigned CIP code 24, "Liberal Arts and Sciences, General Studies and Humanities," rather than a field-specific program code. Therefore, CIP codes

alone do not allow us to differentiate between students enrolled in agriculture, history, or physics programs, for example, or between students in field-specific programs and students who are interested in transferring but undecided on their program. For this reason, we cannot use CIP codes alone to determine whether guided pathways reforms have led to more students entering a major as opposed to being undeclared or in a general studies track.

In part, guided pathways reforms' emphasis on colleges' program offerings and students' pursuit and completion of programs is in response to these issues in how program enrollments are coded at community colleges. When colleges do not know which programs their students are enrolled in, it can be difficult to track students' progress toward completing program requirements and support their success and completion. While we can examine the enrollments and course-taking patterns for students who have assigned field-specific program CIP codes (for example, students pursuing associate of applied science [AAS], associate of science in teaching [AST], associate of fine arts [AFA], and certificate programs) and predict that students in these programs have been affected by guided pathways reforms, many such programs historically have been relatively structured in terms of course requirements and may have had embedded advising, so the effects of guided pathways reforms may be limited for these students. In contrast, we expect that students pursuing AA and AS programs are more likely to experience effects from guided pathways reforms that influence their pursuit of and success in field-specific programs and corresponding course-taking patterns—particularly students who would previously have been guided to enroll in a general studies program and delay pursuing a field-specific program until transferring to a four-year institution. For example, students in STEM AS programs often need to complete STEM coursework early to transfer and progress in a STEM bachelor's program, so those students might be more likely to experience effects from guided pathways reforms that offer early guidance and support to choose a major.

Despite these challenges, we plan to exploit other means to examine students' course-taking patterns and estimate students' program enrollments and their likely course requirements. One way to overcome our data's limitations is by examining the course-taking patterns of students assigned CIP code 24 in terms of enrollment in the courses

required in the state transfer pathways for our three states: the Ohio Guaranteed Transfer Pathways, Tennessee Transfer Pathways, and Washington State's Direct Transfer Agreement associate degrees. Although such an analysis does not take into account students' field-specific program enrollments, it represents a more focused examination of students who are likely pursuing AA and AS degrees. As an example, many students in Tennessee who are pursuing AA and AS degrees are jointly completing the requirements for field-specific Tennessee Transfer Pathways, an agreement that when students complete the courses specified in the transfer pathway, those credits will transfer to the public universities in Tennessee, apply toward a bachelor's degree in the same major, and enable their entry with junior standing in their major.

More broadly, it is challenging for researchers to measure student progress in college. One can look at outcomes at various time points and attempt to build a picture of student progress, but that picture is incomplete, and attention to a specific outcome could distort the broad effects of the reform. The outcomes we plan to examine represent our best attempt at approximating student progress.

Estimating the Effects of Guided Pathways

We are interested in the consequences of moving from a zero or low scale of adoption of guided pathways practices to a high scale of adoption on early student outcomes. To overcome the methodological challenges described earlier, we will use a combination of approaches to estimate the effects of guided pathways. First, we will descriptively examine the broad arc of the reforms' consequences over time. Second, we plan to apply a SITS design and compare community colleges against themselves pre- and post-reform. Third, we propose using a comparative interrupted time series (CITS) approach, which closely resembles a difference-in-differences approach, to estimate the effects of guided pathways reforms. We will use different specifications to model the pre-implementation functional form and different approaches to selecting a comparison group to address potential threats to validity.

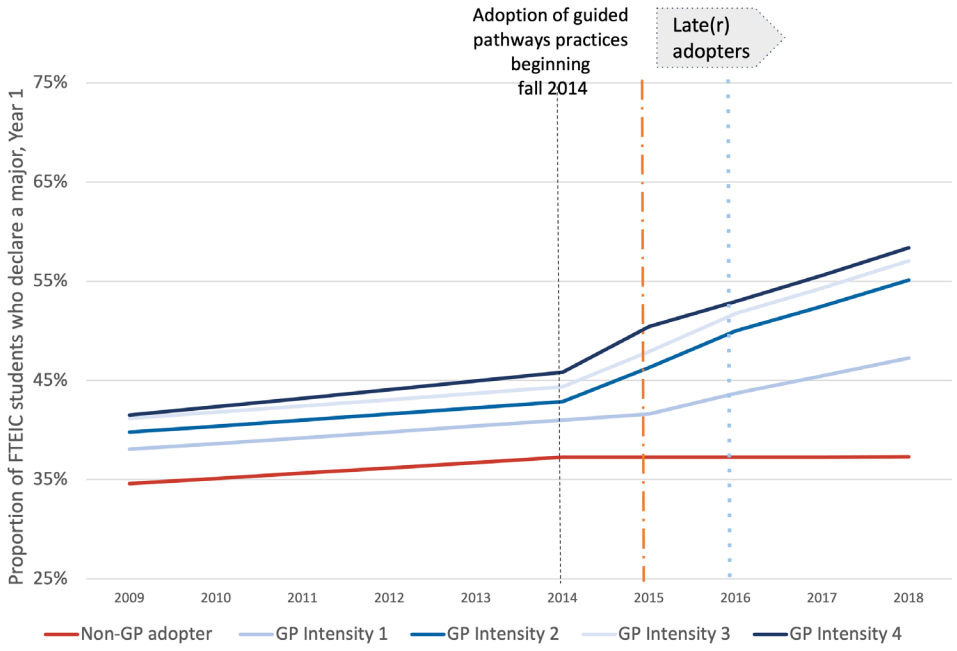
Descriptive analysis. Our approach involves using student unit record data to construct appropriate outcome measures of early academic and program momentum metrics and course-taking patterns. As Loeb et al. (2017) note in their guide to conducting descriptive studies in education, outcomes of interest are not always

comparable over time and across colleges (e.g., the definition of a transferrable course may change over time and be reported differently across colleges or states), and data are not always collected in the same way from one term to the next. We plan to overcome these potential challenges by creating metrics that can be compared across colleges and over time and tracked over the time period pre- and post-reform. We will focus solely on first-time community college students because we want to examine outcomes for a comparable sample of students with no prior college experience.

Using the Guided Pathways SOA survey, we will examine differences in scale of adoption across colleges. To do this, we will first create a continuous treatment variable indicating the level or percentage of guided pathways practices adopted at scale. We will then use this variable to measure scale of adoption of guided pathways practices by generating either discrete categories of adoption (i.e., low, medium, or high) or quartiles in the distribution of adoption.

With appropriate outcome metrics and measures of the scale of guided pathways adoption for each college within each state, we will first examine pre-and post-guided pathways trends in early student outcomes by scale of adoption. Our descriptive analysis will mostly rely on graphical presentation of the means of our constructed outcomes, over time and across colleges and by scale of adoption. These data plots will give us evidence on where and when to expect effects and guide us in modeling pre-adoption trends for the SITS analysis. Figure 4 illustrates the timing and intensity of adoption using hypothetical data. In this hypothetical case, we would expect the greatest effects among colleges with higher intensity of adoption relative to lower intensity (GP intensity 4 vs. GP intensity 1) or non-GP adopters.

Figure 4.
Timing and Intensity of Guided Pathways Adoption (Hypothetical Data)



Single interrupted time series design. We plan to examine how much variation exists in our data in term-to-term changes by state. To do this, we will apply a SITS design to summarize the association between our constructed outcomes and the timing and adoption of guided pathways practices.[5] This approach relies on a comparison of trends before and after the introduction of guided pathways to assess the correlation between guided pathways practices and early student outcomes. As discussed by Bloom (2003), this approach is premised on two claims. First, absent some systemic change, past experience is the best predictor of future experience. Second, using multiple observations from the past to establish a trend provides more reliable predictions of the future than a single observation.

We will use unit record administrative data and a panel of FTEIC students to determine the amount by which early student outcomes change from pre-adoption periods

[5] This model will first be estimated at the student-college-time level, which indicates the intent-to-treat (ITT) effects of guided pathways practices by comparing the outcomes for new students exposed to guided pathways practices based on the year they entered a community college. (Because guided pathways is a college-level intervention, we cannot compare the effects on students who were treated with guided pathways practices [treatment-on-the-treated, or TOT] versus those who were not.) We will also collapse the student unit record data by community college *c* and by year of cohort entry *t* and estimate regressions similar to Equation 1.

to follow-up periods using the baseline mean model or the simplest SITS approach. Taking advantage of multiple years of longitudinal administrative data, we will then extend this model by including a baseline linear time trend, which serves as the benchmark against which the observed post-adoption outcomes are compared. This time trend will also allow us to disaggregate short-term effects from longer term effects. If guided pathways practices involve learning by doing (i.e., if college staff learn more about guided pathways practices as they adopt and implement them and make improvements to their implementation over time) or incrementally affect the student experience, we might expect effects to increase over time. Controlling for pre-adoption trends in outcomes avoids attributing to guided pathways practices any changes we predict would have been observed even if guided pathways practices were not adopted. Specifically, we will estimate the following equation separately for each state:

$$Y_{ict} = \beta_0 + \beta_1 Time_t + \beta_2 TimeGP_t + \beta_3 GP_{it} + \beta_4 X_{it} + \beta_5 Z_{ct} + \varepsilon_{ict} \quad (1)$$

The dependent variable Y_{ict} is a measure of early academic momentum and program momentum for student *i* at time *t* in college *c*. The vector X_{it} includes student-level and course- and program-level characteristics (e.g., gender, race/ethnicity, college readiness status, and major declared at entry). The vector Z_{ct} includes college-level fixed effects and other college-level characteristics to account for any underlying differences across colleges at time *t* (e.g., fraction of FTEIC students who are Black or Hispanic, institutional total revenue, institutional expenditure per student). $Time_t$ is a variable that equals 1 at the first time period *t* and is incremented by 1 for each subsequent time period. The variable GP_{it} indicates whether the student is enrolled at time *t* immediately following the adoption of guided pathways practices and for every time period thereafter. $TimeGP_t$ is a variable that equals 0 until $GP_t + 1$ and is incremented by 1 for each subsequent time period. β_2 and β_3 represent the immediate and subsequent effects of guided pathways practices, respectively. These coefficients estimate the effects of guided pathways adoption on outcomes relative to students in the same college but before guided pathways practices were adopted.

Students' access to and experience of guided pathways practices likely differ by demographic characteristics. We will apply alternative specifications to test for heterogeneity by race/ethnicity, gender, age, and socioeconomic status. These estimates will indicate if guided pathways practices have differentially affected minoritized groups. These results will advance our understanding of whether and how guided pathways practices affect students generally and those from minoritized groups in particular. We will also check the sensitivity of the model specification, especially to our inclusion of college-level fixed effects and other college-level characteristics (but also to alternative assumptions about underlying linear trends).

Comparative interrupted time series design. In the SITS context, unbiased estimates of treatment effects can be achieved only if the pre-adoption period is an accurate predictor of what the future would have been without the adoption of guided pathways practices. This may not be the case for a variety of reasons, often referred to as threats to validity in the SITS literature:

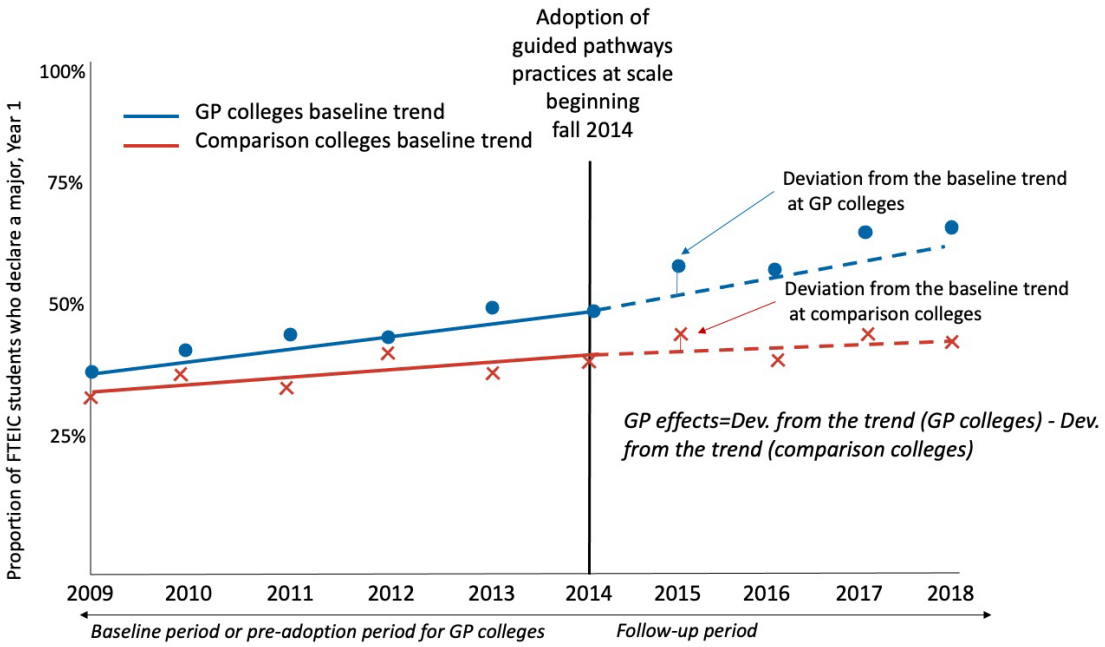
1. Changes in outcomes in relation to pre-adoption trends may occur due to other reforms or unrelated changes that act on colleges implementing guided pathways and occur simultaneously to the adoption of guided pathways practices.
2. The way outcomes are measured may change over time; for instance, students' progression through their programs could be measured with error if program requirements change over time.
3. Selection bias can be a threat if students who attend community colleges that adopted guided pathways practices in the pre-adoption period are inherently different from those who enroll after the adoption of guided pathways practices.[6]
4. Colleges may be endogenous adopters of guided pathways practices such that the timing and intensity of adoption may not be random.

[6] Students who choose to engage with guided pathways practices may also engage in behaviors that lead them to persist in college and declare their programs sooner than those who do not.

In an attempt to address these threats, we will add a comparison group to the SITS to turn it into a CITS design.

We will use unit record administrative data and a panel of FTEIC students to estimate a CITS model that resembles a difference-in-differences approach.[7] We expect to estimate the impact of guided pathways by exploiting the staggered timing of adoption of guided pathways practices across community colleges (within states). Figure 5 illustrates the CITS approach using hypothetical data.

Figure 5.
Estimating the Effects of Guided Pathways Practices Using a Comparative Interrupted Time Series Approach (Hypothetical Data)



In the figure, the vertical line represents the case of a hypothetical at-scale adoption of guided pathways practices beginning in fall 2014. Guided pathways colleges are represented by circles, and comparison colleges represented by *X*s. For each group of colleges, we observe the baseline trend (i.e., before the adoption of guided pathways

[7] The simplest CITS approach—the baseline mean model—resembles the difference-in-differences approach. These two designs are very similar with respect to their estimated bias and precision if the baseline trends in early student outcomes are similar for colleges that adopted guided pathways practices at scale and comparison colleges.

practices in guided pathways colleges) in an early student outcome, such as the proportion of FTEIC students who declared a major within their first year of enrollment. The baseline trend is used to extrapolate beyond the adoption of guided pathways practices. If assumptions are met, the difference in deviations from baseline trends between the guided pathways colleges and comparison colleges should measure the effect of guided pathways practices.

The main idea of using the simplest CITS model is to compute the difference between the mean outcomes of community colleges with high and zero or low scale of adoption of guided pathways practices after the adoption of guided pathways practices and subtract the outcome difference that would have been there already before guided pathways practices had any effect. In some states, however, we will not be able to identify colleges with zero scale of adoption or comparison colleges. For example, the Tennessee Board of Regents has encouraged the adoption of guided pathways practices by all community colleges in their system at the same time. We will attempt to overcome this challenge by using discrete categories of adoption (low versus high) or quartiles (top versus bottom) to compare outcomes for all students who entered colleges with high scale of adoption and those who entered comparison colleges with low scale of adoption.

Differences in outcomes could result from pre-existing events, including demographic shifts and earlier adjustments to practices in reaction to other institutional or state programs, such as Tennessee's Seamless Alignment and Integrated Learning Support (SAILS) program, which embeds the state's developmental math program in its high schools to better prepare students for college-level coursework. Out of concern that this observed-minus-predicted difference reflects not only the effects of guided pathways practices but also the effects of other concurrent events (e.g., corequisite reforms or the Tennessee Promise program), we will compare this difference to that in similar comparison colleges. Our estimates may therefore isolate guided pathways practices' effects to the extent that these other events have the same influence on our outcomes of interest in both sets of colleges.

We will also estimate the effects of guided pathways practices at the student and college levels using Equation 2. To estimate the effects at the college level, we will

collapse the student unit record data to community college *c*, by year-term of cohort entry *t*, and estimate Equation 2 separately for each state:

$$Y_{ct} = \beta_0 + \beta_1 Z_c + \beta_3 GP_{ct} + T_t + \varepsilon_{ct} \quad (2)$$

The dependent variable Y_{ct} represents a college-level measure of early academic and program momentum for college *c* at time *t*. The vector Z_c includes college-level fixed effects. The term GP_{ct} is a continuous treatment variable in a given term indicating the scale of adoption of guided pathways practices as represented by the percentage of guided pathways practices adopted at scale or a discrete category of adoption, such as quartiles 1 and 4 (i.e., colleges that adopted the least and most guided pathways practices, respectively). $T_t$is a vector of year-term fixed effects. The coefficient β_3 yields the difference in the average change in college-level outcomes between treatment and comparison colleges over the period during which guided pathways practices were adopted, net of college and year-term fixed effects. The coefficient β_3 will be estimated using colleges with low scale of adoption as counterfactuals in states where all colleges have adopted guided pathways practices to some extent. We will use alternative approaches to selecting the comparison group, including matching on pre-adoption characteristics and implementing a synthetic control approach. The synthetic control method constructs a weighted average of the potential comparison colleges that best matches the pre-trends observed in the colleges that adopted guided pathways practices at scale. We will implement this analysis at the college-year-term level and match on all pre-adoption values of the outcome variable of interest.

Equation 2 relies on the assumption that trends in the comparison colleges provide a valid counterfactual for trends in the treatment colleges in the absence of guided pathways practices. Though this assumption is inherently untestable, we can provide suggestive evidence on its validity by reestimating Equation 2 but providing the full event-study series of indicators for time relative to the adoption of guided pathways practices.

There are several possible threats to the validity of CITS estimates as indicators of how the adoption of guided pathways practices changed early academic and program

momentum outcomes. First, there is a concern that guided pathways practices are endogenous to college quality. Specifically, colleges with a high scale and speed of adoption may be systematically different from colleges with zero or low scale of adoption. Perhaps colleges that already were experiencing growth or improvements in early student outcomes adopted guided pathways practices faster and with higher intensity than others. We will attempt to alleviate this concern by using alternative methods to select the comparison group in order to improve the quality of the match and by pre-testing for differences in college characteristics. Second, the scale of adoption and the year and term in which a practice is adopted may be subject to measurement error (or colleges may adapt their adoption over time), although we will take care in collecting survey data and applying our rubric to estimate colleges' scale of adoption. Also, with multiple cohorts, it may be possible to test for alternative academic terms of adoption of guided pathways practices and to run placebo tests for terms when we know guided pathways practices were not adopted.

4. Conclusion

Evaluations of whole-institution education reforms are methodologically complex and time- and resource-intensive but critically important to carry out, particularly for reform models being implemented in public education institutions and with the support of state and federal funding. Students attending these institutions—especially students in community colleges, which have been historically and chronically underfunded—deserve high-quality educational practices and supports that evidence indicates are effective in supporting student learning and success. Further, students who have been historically excluded from and marginalized in higher education because of their race, income, gender, and other identities deserve educational practices and supports that are effective in supporting their success and do not perpetuate inequitable treatment and outcomes. Given that approximately 450 community colleges are involved in national or statewide initiatives to implement guided pathways, it is critical to evaluate the reform's effects to determine whether it is leading to the positive changes we expect or if other approaches are needed to improve student outcomes.

Our proposed evaluation strategy assesses variation and scale in each institution's adoption of guided pathways; uses student-level administrative data to examine and disaggregate early outcomes of students experiencing different scales of guided pathways practices; and evaluates the reform using models that provide flexibility in the timing of adoption of these practices, account for different treatment intensities across colleges, and address potential threats to validity. Our research team will apply this evaluation strategy across three states. We will publish what we learn about guided pathways from the evaluation and how this evaluation strategy can be improved for future evaluations of large-scale and whole-college reforms. Because CCRC has been closely involved in the evolution of the guided pathways model, we recognize the importance of being transparent about our process and findings. We will call on our advisory board and external reviewers to examine our methods and findings and continue to encourage third-party evaluations of guided pathways reforms to further our understanding of the model's impacts on community college students.

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Appendix

CCRC Guided Pathways Scale of Adoption Survey

For the last several years, the Community College Research Center (CCRC) has been studying guided pathways reforms at colleges across the country. Guided pathways, which goes by various names locally, is a whole-college reform model that aims to help students choose, enter, and complete community college programs that lead to sustaining-wage employment or transfer with junior standing in a major—and to do so at an affordable cost and in a reasonable timeframe. Now being taken up by hundreds of community colleges nationally, the guided pathways model consists of numerous interconnected changes in practice, implemented over several years and scaled to reach all students.

This survey is part of a National Science Foundation–funded study that CCRC is conducting with the community colleges in Ohio, Tennessee, and Washington to examine the extent to which guided pathways reforms are contributing to changes in early student outcomes. Our research with colleges and practitioners in [STATE] has been critical to our understanding of how these reforms are being adopted and how they are affecting student success and college performance. We greatly value your partnership in this effort to build knowledge for the field and appreciate the time you put into completing this survey.

How is this Scale of Adoption Survey different from previous versions?

The previously administered CCRC Scale of Adoption Assessment (SOAA) was designed primarily as an institutional self-assessment and planning tool. This survey and CCRC's follow-up phone calls are intended to collect information on the scale and timing of the adoption of practices our research indicates are essential to student success.

Who should complete the survey, and how long will it take?

We suggest that a person or persons leading guided pathways or other major student success reforms at your institution complete the survey and solicit input from other individuals as needed. We recommend that the survey be completed by someone who has been at the college for at least five years and knows the history of the college's reform work. (Otherwise, the person will have to reach out to others at the college to confirm when practices were adopted, and the survey may take longer to complete.) We anticipate that the survey may be completed in 60 minutes or less. At the end of the survey, we have provided a space for you to share additional comments about your college's guided pathways reforms. If you have a comment, question, or doubt about a particular survey question, please note the question number and your remarks in the comments box. CCRC will conduct 30-minute follow-up calls with respondents between [Month/Year].

How will CCRC use the survey data?

CCRC will use the survey information together with deidentified student unit record data from [STATE AGENCY] to study whether the scale and timing of the adoption of particular guided pathways practices are associated with college credit accumulation, gateway course completion, and other indicators of "early momentum" in students' first year. We will publish the results in a report and practitioner guide and send them to your college when they are released. *Note that individual colleges will not be identified in the publications we produce from this research.*

College Name: Enter your college's name **Date:** Enter today's date

Please list the names and positions/titles of the persons completing the survey:
Enter names and titles

Area 1: Program Organization/Information

Meta-majors

1. What percentage of credit programs are organized by meta-major or broad field?

   ☐ **At least 80%** of credit programs are organized by meta-major or broad field.

   If yes:

   a. When were at least 80% of credit programs organized by meta-major or broad field? Indicate the term and year.

      Term: Enter term **Year:** Enter year ☐ **Unsure**

   b. Does the college track which meta-major students are enrolled in?

      ☐ **Yes** ☐ **No**

   ☐ **Less than 80% but at least half** of credit programs are organized by meta-major or broad field.

   ☐ **Some but less than half** of credit programs are organized by meta-major or broad field.

   ☐ **None** of our credit programs are organized by meta-major or broad field.

Program Maps

2. What percentage of credit career-technical and workforce programs provide information on course requirements and recommended sequences (program maps) on the college's website?

   ☐ **At least 80%** of credit career-technical and workforce programs provide program maps on the website.

   If yes:

   a. When were program maps for at least 80% of credit career-technical and workforce programs first available on the website? Indicate the term and year.

      Term: Enter term **Year:** Enter year ☐ **Unsure**

   ☐ **Less than 80% but at least half** of credit career-technical and workforce programs provide program maps on the website.

   ☐ **Some but less than half** of credit career-technical and workforce programs provide program maps on the website.

   ☐ **None** of our credit career-technical and workforce programs provide program maps on the website.

3. What percentage of transfer programs provide information on course requirements and recommended sequences (program maps) and requirements for transfer in specific majors

(e.g., AS in biology or AA in psychology, rather than AA in liberal arts or general studies) on the college's website?

☐ **At least 80%** of transfer programs provide program maps and requirements for transfer in specific majors on the website.

If yes:

a. When were program maps and requirements for transfer in specific majors first available for at least 80% of transfer programs on the website? Indicate the term and year.

Term: Enter term **Year:** Enter year ☐ **Unsure**

☐ **Less than 80% but at least half** of transfer programs provide program maps and requirements for transfer in specific majors on the website.

☐ **Some but less than half** of transfer programs provide program maps and requirements for transfer in specific majors on the website.

☐ **None** of our transfer programs provide program maps and requirements for transfer in specific majors on the website.

Math Pathways

4. What percentage of program maps designate a program- or field-specific math sequence (for example, statistics for social science pathways), as opposed to designating college algebra as the default or providing no guidance on which math courses to take?

☐ **At least 80%** of program maps designate a program- or field-specific math sequence.

If yes:

a. When did at least 80% of program maps first designate program- or field-specific math sequences? Indicate the term and year.

Term: Enter term **Year:** Enter year ☐ **Unsure**

☐ **Less than 80% but at least half** of program maps designate a program- or field-specific math sequence.

☐ **Some but less than half** of program maps designate a program- or field-specific math sequence.

☐ **None** of our program maps designate a program- or field-specific math sequence.

☐ **Not applicable.** We do not have program maps.

Area 2: Program Onboarding

Academic and Career Exploration and Program Choice

5. What activities have been adopted for all or nearly all new credit students (not including high school dual enrollment/credit students) to help them explore career and academic interests and choose a program of study when they first enter the college? Select all that apply and

indicate the term and year in which at least 80% of new credit students were experiencing or had access to the activity.

☐ Mandatory orientation

Term: Enter term **Year:** Enter year ☐ **Unsure**

☐ Mandatory orientation with meta-major-specific content

Term: Enter term **Year:** Enter year ☐ **Unsure**

☐ Mandatory career assessment

Term: Enter term **Year:** Enter year ☐ **Unsure**

☐ Mandatory first-year experience course

Term: Enter term **Year:** Enter year ☐ **Unsure**

☐ Mandatory first-year experience course with meta-major-specific content

Term: Enter term **Year:** Enter year ☐ **Unsure**

☐ Field-specific events or activities organized by each meta-major community

Term: Enter term **Year:** Enter year ☐ **Unsure**

☐ Other: Please describe

Term: Enter term **Year:** Enter year ☐ **Unsure**

6. What percentage of first-time students (not including high school dual enrollment/credit students) are advised to take at least one course related to their meta-major or program (other than math, English, or a first-year experience course) in their first term?

☐ **At least 80%** of first-time students are advised to take at least one course related to their meta-major or program in their first term.

If yes:

a. When was this practice first adopted for at least 80% of first-time students? Indicate the term and year.

Term: Enter term **Year:** Enter year ☐ **Unsure**

☐ **Less than 80% but more than half** of first-time students are advised to take at least one course related to their meta-major or program in their first term.

☐ **Some but less than half** of first-time students are advised to take at least one course related to their meta-major or program in their first term.

☐ **None** of our first-time students are advised to take at least one course related to their meta-major or program in their first term.

Educational Planning

7. What percentage of first-time credit program students (not including high school dual enrollment/credit students) are helped to develop a full-program educational plan by the end of their first term?

   ☐ **At least 80%** of first-time credit program students are helped to develop a full-program educational plan by the end of their first term.

   If yes:

   a. When was this practice first adopted for at least 80% of first-time credit program students? Indicate the term and year.

      Term: Enter term **Year:** Enter year ☐ **Unsure**

   ☐ **Less than 80% but more than half** of first-time credit program students are helped to develop a full-program educational plan by the end of their first term.

   ☐ **Some but less than half** of first-time credit program students are helped to develop a full-program educational plan by the end of their first term.

   ☐ **None** of our first-time credit program students are helped to develop a full-program educational plan by the end of their first term.

8. Can students see their educational plans online and determine which courses they have already taken and which they need to take to complete their programs?

   ☐ **Yes** ☐ **No**

   If yes:

   a. When was this practice first adopted for at least 80% of new credit students? Indicate the term and year.

      Term: Enter term **Year:** Enter year ☐ **Unsure**

Enriched Instruction in Program Foundation Courses

9. Have there been formal academic division or college-wide efforts to improve instruction in meta-major or program-related foundation courses (other than math, English, or first-year experience courses)?

   ☐ **Yes,** there have been division- or college-wide efforts to improve instruction in **more than half** of program-related foundation courses.

   ☐ **Yes,** there have been division- or college-wide efforts to improve instruction in **some but less than half** of program-related foundation courses.

   ☐ **No,** efforts to improve instruction have been initiated at the department or faculty levels and not in divisions or college-wide.

Corequisite Support in Math

10. What percentage of first-time students (not including high school dual enrollment/credit students) who are deemed to need remediation in math are placed in a corequisite math course (i.e., a college-level math course with academic support)?

    ☐ **At least 80%** of first-time students who are deemed to need remediation in math are placed in a corequisite math course.

    If yes:

    a. When was this practice first adopted for at least 80% of first-time students? Indicate the term and year.

    Term: Enter term **Year:** Enter year ☐ **Unsure**

    ☐ **Less than 80% but more than half** of first-time students who are deemed to need remediation in math are placed in a corequisite math course.

    ☐ **Some but less than half** of first-time students who are deemed to need remediation in math are placed in a corequisite math course.

    ☐ **None** of our first-time students who are deemed to need remediation in math are placed in a corequisite math course.

11. Does the academic support provided to students in corequisite math align with the content of their college-level math course? (For example, do students in college-level statistics have statistics-focused learning support?)

    ☐ **Yes** ☐ **No** ☐ **Not applicable**

Area 3: Ongoing Support

Student Advising

12. What systems and structures are in place to support the monitoring of students' progress on their educational plans? Select all that apply and indicate the term and year in which at least 80% of credit students were experiencing this form of advising.

    ☐ a. Mandatory advising, first term

    Term: Enter term **Year:** Enter year ☐ **Unsure**

    ☐ b. Mandatory advising, subsequent terms (advisors must sign off before students can register)

    Term: Enter term **Year:** Enter year ☐ **Unsure**

    ☐ c. Checkpoint advising (required appointments with advisors at key progress milestones)

    Term: Enter term **Year:** Enter year ☐ **Unsure**

    ☐ d. Caseload advising (each student is assigned to a specific advisor)

    Term: Enter term **Year:** Enter year ☐ **Unsure**

☐ e. Automatic registration alerts (to notify when students have registered for courses not on their educational plan)

Term: Enter term **Year:** Enter year ☐ **Unsure**

☐ f. Other: Please describe

Term: Enter term **Year:** Enter year ☐ **Unsure**

☐ g. Other: Please describe

Term: Enter term **Year:** Enter year ☐ **Unsure**

13. Are professional or faculty advisors assigned to students in specific meta-majors or broad fields?

☐ **Yes** ☐ **No**

If yes:

a. When was field-specific advising first adopted? Indicate the term and year.

Term: Enter term **Year:** Enter year ☐ **Unsure**

Class Scheduling Based on Educational Plans

14. Does the college develop its course schedule based on data from students' educational plans?

☐ **Yes** ☐ **No**

If yes:

a. When did the college begin scheduling classes based on students' educational plans? Indicate the term and year.

Term: Enter term **Year:** Enter year ☐ **Unsure**

15. Does the college provide class schedules for one or more full years so that students can see the course offerings and times for future terms?

☐ **Yes** ☐ **No**

If yes:

a. When did the college begin offering yearlong schedules? Indicate the term and year.

Term: Enter term **Year:** Enter year ☐ **Unsure**

Optional

Use the space below to share any additional comments about your college's guided pathways reforms. You may also include questions or doubts about particular survey items or responses.

Enter your response here

Table A1.
Rubric to Estimate Colleges' Scale of Adoption of Guided Pathways Practices

Practice and Definition	Scale/Timing Indicator	Validation Methods	Scoring Rubric
Area 1: Program organization/information Clarify paths to student end goals by backward-mapping all programs to ensure they prepare students for direct entry into sustaining-wage employment and further education.			
1A. Meta-majors Programs are organized by meta-major or broad field of study.	1, 1a	College website (presence of meta-majors)	0 = no meta-major structure 0.5 = meta-major structure used either in onboarding or on website but not both 1 = all programs organized by meta-major; meta-major structure used in onboarding and on website
1B. Career-technical and workforce program maps Credit-bearing career-technical and workforce program maps show required courses and recommended term-by-term course sequencing.	2, 2a	College website (presence of career-technical and workforce maps)	0 = no or limited term-by-term program maps 1 = program maps for all career-technical and workforce programs available on website
1C. Transfer program maps Transfer program maps show required courses and recommended term-by-term course sequencing for transfer in specific majors (e.g., AS in biology and AA in psychology, rather than AA in liberal arts or general studies).	3, 3a	College website (presence of transfer maps)	0 = no or limited term-by-term program maps 1 = program maps for all transfer programs available on website
1D. Math pathways Workforce and transfer program maps include field-relevant math course(s).	4, 4a	Administrative data (analysis of trends in math course-taking by subject)	0 = program maps include all gateway math courses as potential math course options 1 = all program maps either specify or recommend the aligned math course, including information about whether the required course differs by transfer destination
Area 2: Program onboarding Help students get on a program path by redesigning new student onboarding so that all students actively explore their options and interests, take program-relevant courses, connect with faculty and students in an academic and career community, and develop a full-program educational plan in their first term.			
2A. New student orientation New students are required to attend a career and program-focused orientation.	5a	Phone interview	0 = orientation is not required or does not include content focused on academic and career exploration 1 = college indicates that orientation is required for most new students (80%+) and includes content focused on academic and career exploration

Practice and Definition	Scale/Timing Indicator	Validation Methods	Scoring Rubric
2B. Required career assessment New students are helped to complete and discuss the results of a career assessment or interest inventory.	5c	Phone interview	0 = new students are not helped to complete a career assessment or interest inventory 0.5 = college indicates that most students (80%+) are required to complete a career assessment or interest inventory but there is limited follow-up by advisors to discuss the results with students 1 = college indicates that most students (80%+) are required to complete a career assessment or interest inventory and students and advisors discuss results in a follow-up meeting
2C. First-year experience course New students are required to participate in a first-year experience course.	5d	Administrative data (analysis of enrollment in first-year experience course) College website College catalog Phone interview	0 = college does not offer a first-year experience course or does not require new student enrollment in the course 0.5 = college indicates that most new students (80%+) participate in a mandatory first-year experience course but the course is not focused on career and program exploration; college indicates that first-year experience course is focused on career and program exploration but is not required for new students 1 = college indicates that most new students (80%+) participate in a mandatory first-year experience course and the course is focused on career and program exploration content
2D. First-term enrollment in courses of interest New students are advised to take at least one course in their meta-major or program of interest in their first term.	6	Phone interview	0 = most students are not advised to take a course in their meta-major or program of interest in their first term 1 = most new students (80%+) are advised to take at least one course in their meta-major or program of interest in their first term
2E. Educational planning New students are helped to make an individualized, full-program educational plan by the end of their first term.	7, 7a	Phone interview	0 = most students do not create a one-year or full-program educational plan by the end of their first term 0.5 = most students (80%+) create a one-year educational plan by the end of their first term 1 = most students (80%+) create a full-program educational plan by the end of their first term

Practice and Definition	Scale/Timing Indicator	Validation Methods	Scoring Rubric
Area 3: Ongoing support Keep students on path by scheduling classes and monitoring students' progress based on their plans to ensure timely and affordable program completion.			
3A. First-term advising New students are required to meet with an advisor during their first term.	12a	Phone interview	0 = most students are not required to meet with an advisor in their first term 1 = most new students (80%+) are required to meet with an advisor in their first term
3B. Mandatory advising, subsequent term or checkpoint advising Students meet with advisors at regular intervals.	12b, 12c	Phone interview	0 = most students are not required to meet with an advisor according to regular milestones beyond the first term 1 = most students (80%+) are required to meet with an advisor according to regular milestones beyond the first term
3C. Caseload advising Advisors are assigned a caseload of students.	12d	Phone interview	0 = college does not designate advisors 1 = most students (80%+) have designated advisors
3D. Field-specific advising Advisors are assigned a caseload of students by meta-major or program.	13, 13a	Phone interview	0 = college does not designate advisors by program or meta-major 1 = most students (80%+) have designated advisors in their program or meta-major
3E. Class schedules based on plans Classes are scheduled based on the courses students need to progress on their plans.	14, 14a	Phone interview	0 = college does not use educational plan data as a direct input to generate upcoming term class schedules 1 = college uses data about needed courses from students' educational plans to generate upcoming term class schedules

Table A2.
Sample Colleges' Scale of Adoption, Areas 1–3, at Time of Survey Pilot
(Sample Colleges A and B, December 2021; Sample College C, February 2022)

College	Area 1 Practices 1A–1D	Area 2 Practices 2A–2E	Area 3 Practices 3A–3E	Total GP Practices (Out of 14)
Sample College A	1 0 1 1 **Total: 3**	1 1 1 0 1 **Total: 4**	1 1 1 1 1 **Total: 5**	12
Sample College B	1 1 1 1 **Total: 4**	1 1 1 0 1 **Total: 3**	1 0 0 0 0 **Total: 1**	9
Sample College C	1 1 1 1 **Total: 4**	1 0 1 1 1 **Total: 4**	1 0 1 1 1 **Total: 4**	12

Note. This table illustrates the degree to which the scale of adoption of guided pathways practices can vary across institutions in three states. Data was collected from Sample Colleges A and B in December 2021 and from Sample College C in February 2022.