# Improving High Schools through STEM Early College Strategies

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## The Impact of the STEM Early College Expansion Partnership (SECEP)

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SERVE Center

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# IMPROVING HIGH SCHOOLS THROUGH STEM EARLY COLLEGE STRATEGIES:

## THE IMPACT OF THE STEM EARLY COLLEGE EXPANSION PROJECT


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## BACKGROUND INFORMATION ABOUT THE SERVE CENTER

The SERVE Center at the University of North Carolina at Greensboro (UNCG) is a university-based research, development, dissemination, evaluation, and technical assistance center. Its mission is to support and promote teaching and learning excellence in the K-12 education community.

Since its inception in 1990, SERVE has been awarded over $200 million in contracts and grants. It has successfully managed 14 major awards including four consecutive contracts for the Regional Educational Laboratory for the Southeast (REL-SE) funded by the Institute of Education Sciences (IES) at the US Department of Education (USED) and four awards from USED for the National Center for Homeless Education (NCHE). In addition, past SERVE awards include a five-year Technology Grant for Coordinating Teaching and Learning in Migrant Communities, three consecutive contracts as the Eisenhower Consortium for Mathematics and Science Education for the Southeast, and two consecutive Regional Technology in Education Consortium grants.

At the national level, SERVE operates the National Center for Homeless Education (NCHE), USED's technical assistance and information dissemination center in the area of homeless education. NCHE uses state-of-the-art technology for web communication and online professional development and for supporting state coordinators of homeless education, local program coordinators, educators, parents, and advocates in all 50 states and in 15,000 school districts.

In addition to national-level NCHE activities, SERVE currently conducts research studies and evaluations under grants and contracts with federal, state, and local education agencies. Examples of SERVE's grant-funded research work include three federally funded studies of the impact of Early College High Schools and a five-year study of the impact of dual enrollment in Carolina. Contract work includes evaluations of four Investing in Innovation (i3) projects, the Winston-Salem/Forsyth County Magnet Program in North Carolina, the Guilford County Schools teacher incentive program (Mission Possible), the USED-funded Bridges to Early Learning Project in South Carolina, and North Carolina's Race to the Top Initiative. The *Guiding Principles for Evaluators* (American Evaluation Association, 2004) and the *What Works Clearinghouse Standards* (Institute of Education Sciences, October, 2017) guide the evaluation work performed at the SERVE Center.

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## SECTION I: INTRODUCTION AND OVERVIEW

The changing U.S. economy means that jobs that pay a living wage are more likely to require some form of postsecondary education, particularly in fields related to science, technology, engineering, or mathematics, known as STEM for short (Carnevale & Desrochers, 2003; Carnevale, Smith, & Strohl, 2010). Yet, concerns remain that too few students are successfully earning postsecondary credentials, particularly in STEM areas. The problem is particularly acute for certain populations of students, including low-income students, students who are the first in their family to go to college, and students who are members of racial and ethnic groups underrepresented in college. In response to these concerns, educators and policymakers have been exploring a variety of approaches at the high school level to increase students' interest and skills in STEM and to increase their likelihood of enrolling and succeeding in postsecondary education.

One of the most successful efforts to increase students' enrollment and success in postsecondary education has been the Early College. As originally conceptualized, Early Colleges are small schools focused purposefully on college readiness for all students. Frequently located on college campuses, Early Colleges target students who might face challenges in postsecondary education. Early Colleges serve students starting in 9$^{th}$ grade; the goal is to have students graduate in four or five years, with a high school diploma and either a postsecondary credential (usually an associate degree) or two years of transferable college credit. Supported by an initial investment by the Bill and Melinda Gates Foundation, the small Early College Model expanded across the country.

This model has been the subject of three rigorous longitudinal experimental studies funded by the U.S. Department of Education and led by SERVE Center at UNCG and an experimental study conducted by the American Institutes of Research. These studies found that the Early College Model had positive impacts on a variety of outcomes, including staying in school, progressing in college preparatory courses, graduating from high school, and enrolling in and graduating from college (Berger et al., 2013; Edmunds, Bernstein, Unlu, Glennie, & Smith, 2013; Edmunds et al., 2012; Edmunds, Unlu, et al., 2017; Edmunds, Willse, Arshavsky, & Dallas, 2013).

As implemented, the Early College is not necessarily required to have a focus on STEM, although some Early Colleges have structured themselves around STEM themes. There is little research, however, on how STEM can be successfully integrated into the Early College Model. Additionally, there is little research that indicates whether and how the small Early College Model can be scaled to comprehensive high schools. Studies undertaken of two recent efforts to implement the model in comprehensive high schools have found that the schools can make

some changes, although it is challenging work (Edmunds, Klopfenstein, Lewis, & Hutchins, 2018; Edmunds, Naumenko, Henson, & Hutchins, 2017). The STEM Early College Expansion Partnership (SECEP) is among the first set of large-scale efforts to apply Early College strategies in comprehensive high schools and the first one to attempt to simultaneously integrate STEM instructional and curriculum changes.

Supported by a $12 million grant from U.S. Department of Education's Investing in Innovation (i3) Program, SECEP is designed to

> …improve STEM education for 22,000 high-need middle and high school students, decreasing drop-out rates and boosting college enrollment in a number of districts in Connecticut and Michigan. SECEP will further improve underrepresented populations' access to STEM careers by increasing the number of students enrolling in dual credit STEM courses and pursuing postsecondary credentials (SECEP Year 2 Management Plan).

SECEP took place in two areas: Bridgeport, Connecticut and four intermediate school districts (ISDs) in Michigan. The project was a partnership between three primary organizations, each with a long history of Early College work. The overall effort was led by the National Center for Restructuring Education, Schools and Teaching (NCREST) at Teachers College, Columbia University, collaborating with Jobs for the Future (JFF), and the Middle College National Consortium (MCNC). JFF was responsible for project implementation in Bridgeport, and MCNC was responsible for project implementation in Michigan.

SECEP set a bold goal for itself: 90% of students in SECEP schools would graduate high school with some college credit. This goal was intended to promote broader change in the schools, focusing on four Design Principles that are described in more depth in Section II of the report.

This report presents findings on the impact of this five-year project, including results for schools and students. The next section of the report describes the STEM Early College Model in more detail. Section III includes the methodology used to assess the impacts on schools and an overview of the student impact methodology. Section IV utilizes survey and interview data to describe the impact of the project on schools. Because of differences in data availability that impacted the study design, student impacts for Michigan and Connecticut are reported in separate sections. Section V describes the student impact analysis methodology and results for Michigan and Section VI describes the methodology and results for Connecticut. The report ends with key conclusions and lessons for educators to consider as they move forward with this work.

## SECTION II: THE STEM EARLY COLLEGE HIGH SCHOOL MODEL AND ITS SUPPORTS

SECEP's goal was to redesign high schools by focusing on STEM curriculum and instruction in schools while also expanding access to college courses for students. The project team did this through supporting the implementation of the STEM Early College High School Model in comprehensive high schools.

### STEM Early College High School Model

The STEM Early College High School Model, as articulated by NCREST and its partners, included four Design Principles: (1) a STEM College-Focused Academic Program, (2) Student Support, (3) High School-College Collaboration, and (4) a Culture of Continuous Improvement. To support implementation, the SECEP project staff developed a rubric that described implementation of these Design Principles. These Design Principles are described in this section and are also operationalized more fully in the section on school-level impacts.

### STEM College-Focused Academic Program (Design Principle #1)

According to the SECEP Design Principles rubric, the first Design Principle was defined as: "Schools implement comprehensive, standards-based, STEM-focused curricula that provide a bridge to STEM postsecondary studies."

One of the core expectations of the model was that students have access to college courses while in high school, with an emphasis on STEM-oriented pathways. Schools were expected to implement a 4-5-year academic plan that included a sequence of STEM and non-STEM courses, preparing students for college and providing opportunities for college credit. The intent was that these pathways would give students a head start on specific college majors or prepare students for careers, primarily focused on STEM. The project encouraged schools to create systems that would allow students to earn at least 12 college credits by the time they graduated from high school.

In addition to curricular emphases, there was also an emphasis on changing instruction in two areas: college readiness and STEM. Schools were expected to ensure that students were ready for college courses by increasing the rigor of instruction and embedding key college preparatory and college navigational skills into high school courses. Teachers were also expected to utilize STEM instructional practices, such as inquiry-based learning and problem- and project-based learning.

### Student Support (Design Principle #2)

Under this Design Principle, "Supports are offered to all students to meet their academic, social, and emotional needs in high school and the transition to college." This Design Principle

recognizes that the rigor of the student experience cannot be increased without accompanying supports that will help students be successful.

The expectation was that each school would develop a system of supports tied to students' needs and their academic progression. As noted in the rubric, "High schools support students: (1) to stay on track academically, (2) to prepare for college, (3) in STEM coursework, (4) in college coursework, (5) in meeting socio-emotional needs." These supports also included counseling relative to career readiness and to expose students to STEM careers.

### High School-College Collaboration (Design Principle #3)

The Early College Model also depends on close collaboration between the district and its college partner(s), including ongoing communication and shared resources. According to the rubric, "High schools and colleges take joint responsibility for students' educational success." Each school or district was expected to have a formal Memorandum of Understanding with at least one college partner that delineated roles and responsibilities for each partner. There were also expectations regarding ongoing communication between the partners and continuing collaboration around courses and supports.

### Culture of Continuous Improvement (Design Principle #4)

The fourth Design Principle includes an emphasis on using data to make decisions as well as aligning the high school and postsecondary curriculum: "High schools and colleges engage in evidence-based discussions to continuously improve students' experiences and outcomes." The intent was that each school create processes by which data were being used to inform instruction. Additionally, schools were expected to offer teachers regular and ongoing professional development related to the goals of the project and support ongoing teacher collaboration.

## Implementation Supports

To support implementation of the STEM Early College Model in school, SECEP partners provided a suite of services including: (1) leadership coaching to districts, (2) workshops and conferences, (3) a Community of Practice, (4) school-based SECEP coaching, (5) district-level teams, and (6) district-college collaboration. Each is described in more depth below.

### Leadership Coaching to Districts (Implementation Support #1)

Staff from the SECEP partners (JFF in Bridgeport and MCNC in Michigan) provided leadership coaching and technical assistance to districts to help them develop the capacity to plan, monitor, and implement the STEM Early College Model in their district. Part of this technical assistance included support around the development of an implementation plan that aligned

the multiple initiatives within each district and training for individuals who would serve as SECEP coaches directly to the schools.

Data collected for the evaluation indicate that leadership coaching and technical assistance to the districts took various forms: monthly meetings with key district representatives, assistance with developing a strategic plan, individual coaching for district staff, collecting data during site visits, reviewing data with districts leaders, problem solving, monitoring implementation, developing annual plans, and developing workshops.

All districts were provided with a template to complete annual plans intended to guide project implementation. District staff noted in their reports that they worked with project teams on these plans. The plans (1) focused on the SECEP Design Principles; (2) examined the implementation process, professional development needs, school structures, and resources; (3) named persons accountable for implementation; and (4) used evidence to show whether they had achieved their goals.

The project staff also worked with district staff to support collaboration between the districts and their college partners; more specifically, the development of academic plans, curricula, course sequences, scope and sequences, and STEM pathways.

The expectation was that each district would receive an average of 22 contacts annually. This expectation was met each year and, in many cases, substantially exceeded. For example, on average, in the fourth year of implementation, the project staff had over 165 substantive technical assistance interactions with the district staff, although there was substantial range across districts from a low of 34 interactions in one district to a high of 432 in another.

### Workshops and Conferences (Implementation Support #2)

Training is seen as an important part of implementation, providing people exposure to important information (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005). SECEP partners provided workshops and conferences that focused on different components of the STEM Early College Model. Participants from both states attended the MCNC Summer Institute annually. At that conference, the SECEP districts brought a team and attended sessions focused on developing Early/Middle College Programs, academic support for students, instructional strategies, and analysis of SECEP data. This conference also provided teams time to reflect on the previous year and begin planning for the next academic year. Each state also had their own regional/state conferences that included topics such as: implementing project-based learning, instructional strategies, developing effective lessons, implementing engineering thinking and signature pedagogical approaches to STEM instruction, and assessment.

A key activity during the national and state conferences was modeling the use of data to guide program improvement. NCREST staff collected and analyzed formative data to share with the

districts and schools on an ongoing basis. These formative data consisted of a student survey, publicly available data, outcomes data, and college enrollment data, and the staff survey results from the external evaluation. The NCREST team facilitated data discussions with the schools, helping them understand how the data could inform their work.

Finally, there were professional development opportunities at the local level that were scheduled according to needs identified by the schools and districts. These opportunities were provided by a range of individuals and groups, including local teachers or administrators, district staff, Teachers College professors/staff, or external organizations that provided relevant training. The topics primarily focused on STEM instruction and included science and math integration, integrating technology, instructional rounds, and inquiry science training.

Participants in the professional development included both district and school staff, who were, respectively, expected to participate in at least five days of professional development annually. This expected level was met or exceeded each year. For example, in the fourth year of implementation, district teams participated in an average of 27 days of professional development with participation ranging from a low of 10 days in one district to a high of 80 in another. School teams participated in an average of 14 days of professional development with a low of 6 and a high of 39 days.

### Community of Practice (Implementation Support #3)

One of the project's supports was the creation of a common, online Community of Practice (COP) where resources and ideas could be shared across states and districts. The website that hosts this community was launched in December 2015 by JFF; it provided links to resources, experts, webinars, and calendars relevant to the SECEP project. The site represented the online community of districts involved in SECEP as well as other districts doing Early College reform under JFF guidance. As part of the COP, JFF staff and their guest presenters delivered a series of webinars focused on topics such as project-based learning, technology integration, growing the number of dual enrollment teachers, data use, redesigning the high school experience, school culture, work-based learning, and instructional coaching. The COP has archived these webinars and other resources on topics such as coaching, instructional practices, and sustainability.

### School-Based SECEP Coaching (Implementation Support #4)

Another key support was the provision of SECEP coaching services directly to the schools. Coaching that follows up on professional development is important to the success of program implementation (Fixsen, Blase, Naoom, & Wallace, 2009; Joyce & Showers, 2002). Intended to provide support around implementation of the SECEP Model, SECEP coaching was structured very differently in the two states.

In Bridgeport, the model included a JFF instructional coach, a JFF leadership coach, coaches from Teachers College, and district- and school-based coaches. The JFF leadership coach worked with principals and their leadership teams in schools, reviewing data and progress toward the SECEP deliverables. The JFF instructional coach worked with district staff, including district-based instructional coaches, and provided professional development and support. This instructional coach worked with school staff on implementation of the Common Instructional Framework, a set of six student-centered instructional practices designed to prepare students for college. During the fourth year of the project, this coach also began working with school leaders. The coaches from Teachers College worked with school staff around implemented STEM-focused instructional practices.

Bridgeport also had school-based teacher leaders and instructional coach consultants. The teacher leaders only worked in their home school. In Years 2 and 3, two district-level consultants each worked with three schools, providing support to six out of nine project schools. However, by the middle of Year 4, there was only one district consultant working in three project schools.

In Michigan, the coaching was carried out by staff from the Intermediate School District (ISD) or the local district, who used a mix of training, technical assistance, and instructional coaching to support school staff. These staff members coached teachers at the school, facilitated SECEP school team meetings, and brought additional resources. In addition to district support, all the ISDs either employed someone to provide school-level instructional coaching full time or had their teacher leaders providing coaching or assistance to other teachers. Across the ISDs, the coaches were former or current classroom teachers and/or administrators familiar to the staff. When the schools did not have an internal coach, the ISD provided coaches that worked with the professional learning teams and individual teachers as needed and facilitated leadership meetings.

The expectation was that each school was to receive at least 12 coaching days annually in Years 2 and 3, with a reduction in Year 4 to 10 days per high school and 2 days per middle school. This expectation was not met for Year 2, but it was met for Years 3 and 4. In the fourth year of implementation, the high schools received an average of 19 days of coaching support with the amount ranging from 6 to 34 days. The middle schools received an average of 10 days of coaching, ranging from a low of 2 days to a high of 34 days.

### District-Level SECEP Implementation Teams (Implementation Support #5)

Having a core group of individuals who meet together regularly to support implementation is an important component of implementation (Meyers, Durlak, & Wandersman, 2012). Each ISD or district was expected to create a SECEP team that would serve as an organizing structure for implementation. Each district created teams which met regularly and discussed grant-related

issues such as information on relevant professional development, and general district or state policy that might impact the SECEP work. In interviews, respondents noted that the SECEP team was an important implementation tool, which (1) provided networking and support to school and district leaders, (2) helped to share information and served as a resource, (3) created a sense of urgency and priority for the project, and (4) provided accountability for the school leaders.

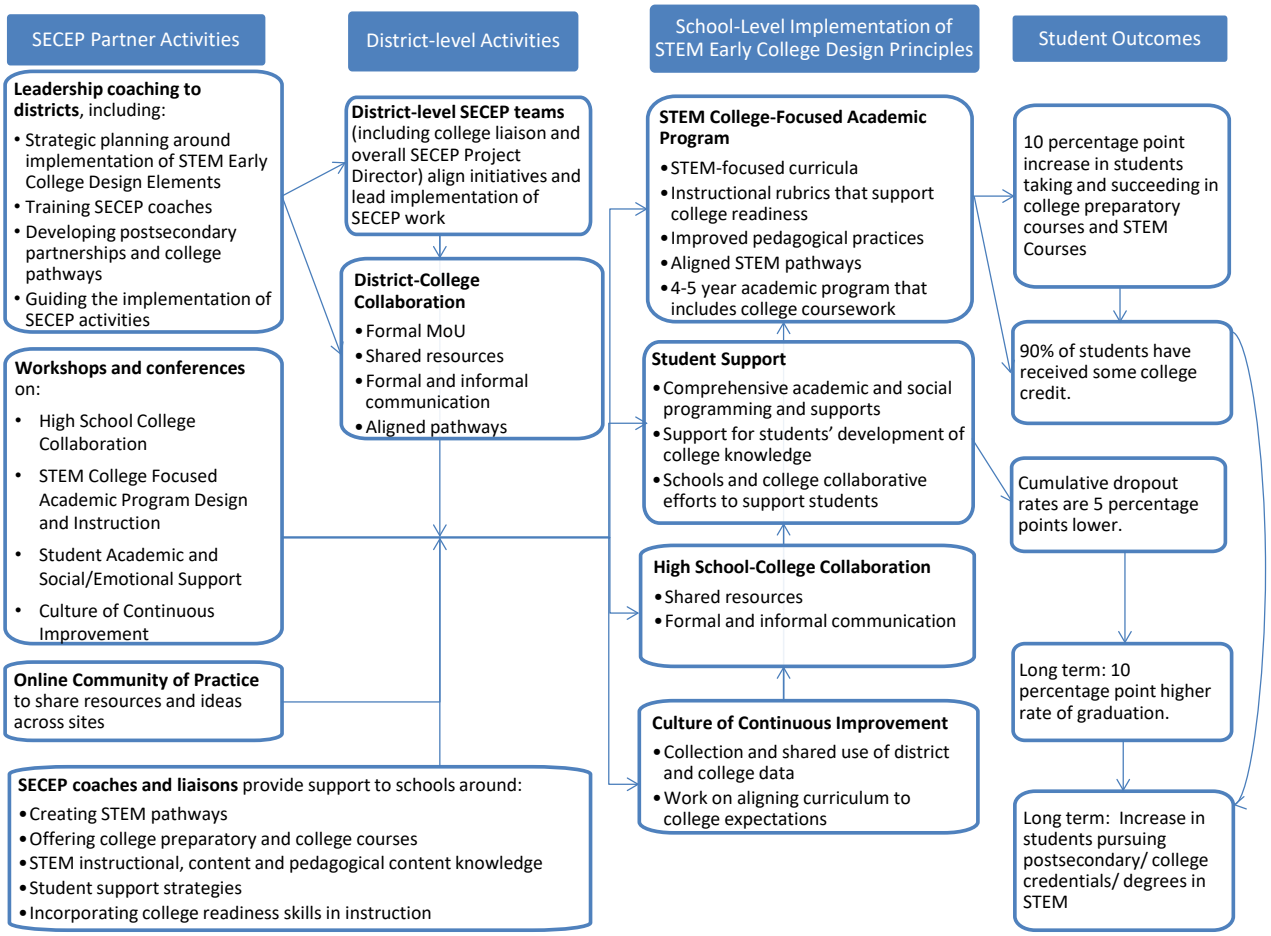
### District-College Collaboration (Implementation Support #6)

The final key support of the grant was district-college collaboration, whereby ISDs and/or districts developed postsecondary partnerships and pathways. Each local district had a formal Memorandum of Understanding (MOU) with at least one college partner. Each district also developed a series of pathways that aligned high school and college courses. For example, one district had pathways that led to degrees and certificates in: Computer Occupations Technology–Applications Developer, Computer Occupations Technology–Computer Security, Nursing, Automotive Technology, and Industrial & Manufacturing Technology.

## SECEP Logic Model

The implementation supports were intended to promote implementation of the Design Principles in schools, which were then expected to lead to improved student outcomes. The SECEP Logic Model (Figure 1) is a graphic representation of the project's activities, the changes expected to occur at the school level, and the longer-term student outcomes the program was designed to impact. This logic model guided the work of the evaluation.

*Figure 1. SECEP Logic Model*



## SECTION III: EVALUATION METHODOLOGY

The impact study was designed to answer two key research questions:

1. What is the impact of SECEP on schools' implementation of the STEM Early College Design Principles?
2. What is the impact of SECEP on key student outcomes related to college-level coursetaking and remaining in school?

This section describes the procedures used to assess the impact on schools' implementation of the Design Principles and provides an overview of the approach used to assess student outcomes. The state-specific student impact methodologies are described in more depth in their respective sections along with the results.

### Examining Impact on Schools' Implementation of the STEM Early College Design Principles

As described in Section II, schools were expected to implement the four SECEP Design Principles, which, in turn, were expected to lead to improved student outcomes, a primary goal of this grant. The implementation of the Design Principles was evaluated via a staff survey and interviews with district, college, and school staff during site visits. The methodology for the survey and site visits is described in the next two sections.

### Staff Survey Methodology

Over the course of the grant, the SECEP staff implementation survey was administered four times. The first administration occurred between late January and early May of 2015. The second and third administrations occurred between early February and late March of 2016 and 2017, respectively, while the fourth occurred during February of 2018. The online survey was administered to all staff at program schools and to only the principals (or designated staff) at matched comparison schools.

#### *Staff Survey Content*

The survey was primarily intended to measure staff perceptions of the implementation of the SECEP Design Principles in each school. Additionally, the survey measured program implementation components such as: (1) buy-in and understanding of the program; (2) participation in, and perceptions of, professional development and coaching; and (3) perceived impacts of the program. Given that the Design Principle components (e.g., college readiness and project-based learning) and implementation components (e.g., professional development and coaching) could be implemented in schools without being directly involved in SECEP, most questions (such as those administered to both treatment and comparison schools) were structured without mention of the SECEP project.

Most survey items were analyzed as scales, with a few items analyzed individually. Table III- 1 provides an overview of the survey scales, including sample items on each scale, response options, and reliability. To determine reliability, Cronbach's $\alpha$ was calculated using responses from the first two survey administrations (reliability analysis suggests moderate to good reliability for most scales with Cronbach's alpha values ranging from .76 to .92). When teachers and administrators answered the same questions, data from all staff were used; in all other cases, only the teachers' data were used to determine the scale reliability. A table listing all items on each scale can be found in Appendix A.

*Table III-1. Summary of Survey Scales' Properties and Questions*

| Staff Scale | $\alpha$ | Sample Questions | Response Options |
|---|---|---|---|
| SECEP Program Understanding and Buy-in | .88 | • I understand the goals and objectives of the SECEP program that is being implemented in our school.<br>• All staff in this school share a goal of preparing every student for postsecondary education without remediation. | 1 = Strongly Disagree<br>2 = Disagree<br>3 = Agree<br>4 = Strongly Agree |
| College-Going Expectations | .81 | • Most faculty and staff in this school expect every student to receive at least some postsecondary education or training.<br>• Our school explicitly and purposefully focuses on building students' postsecondary aspirations. | |
| College Readiness | .84 | • The school has clearly articulated goals for academic college readiness (such as content knowledge, writing, reading, and critical thinking skills, etc.).<br>• Staff incorporates measures of academic college readiness into their classroom. | 1 = Not True at All<br>2 = Somewhat True<br>3 = Mostly True<br>4 = Entirely True |
| School Academic and Social-Emotional Support | .85 | • Our school has a system to identify students in need of academic support.<br>• Our school has a system to provide support to students taking college courses. | |
| Staff Academic and Social-Emotional Support (T, A) | .78 | • I regularly provide academic supports to students who need it.<br>• Most staff regularly provide academic supports to students who need it. | 1 = Not True at All<br>2 = Somewhat True<br>3 = Mostly True<br>4 = Entirely True |
| College Readiness Skills | .76 (T)[1]<br>.92 (A) | In the current school year, how often have you:<br>• Worked with students on time management and study skills?<br>• Encouraged students to advocate for themselves with high school and college faculty? | 1=Never<br>2=A Few Times This Year<br>3=Once or Twice a Month<br>4=Once or Twice a Week<br>5=Almost Every Day |
| Rigorous Instruction | .84 | In the current school year, how often have you:<br>• Asked students to defend their own ideas or point of view in writing or in a discussion?<br>• Asked students to analyze or interpret documents or data? | |
| Inquiry, Project-Based Learning | .82 | In the current school year, how often have you:<br>• Had students develop their own questions and then answer them?<br>• Implemented projects in your classrooms? | |
| High School and College Collaborations | .90 | This school year, how often did you meet with college faculty:<br>• to understand college expectations in my subject area.<br>• to improve student opportunities to study in STEM areas. | 1 = Never<br>2 = 1 - 2 Times<br>3 = 3 - 6 Times<br>4 = More Than 6 Times |
| Local College Support | .89 | To what extent have you or your school received the following resources/supports from your local college over the past year?<br>• Research or internship opportunities<br>• College courses | 1 = None<br>2 = A little<br>3 = A fair amount<br>4 = A lot |

[1] "T" indicates teacher items and "A" indicates administrator items.

### *Staff Survey Sample*

The online survey was administered to certified staff in treatment schools and to administrators (or their surrogate) in comparison schools. Table III-2 displays the number of treatment respondents, by role and state, on the first (2015) and fourth (2018) survey administrations. In 2018, the online survey was completed by 325 teachers and 67 administrators and other staff in the 13 SECEP schools that participated in both survey administrations. The average response rate in 2018 was 66% with a range of 50% to 90% in all participating SECEP schools. In 2015, the overall response rate was 69%.

*Table III-2. Sample Characteristics*

| | First Survey (2015) | | | Fourth Survey (2018) | | |
|---|---|---|---|---|---|---|
| | SECEP all | CT | MI | SECEP all | CT | MI |
| Role | Total Number (Percentage) of Respondents | Total Number (Percentage) of Respondents | Total Number (Percentage) of Respondents | Total Number (Percentage) of Respondents | Total Number (Percentage) of Respondents | Total Number (Percentage) of Respondents |
| Teacher | 372 (82.5%) | 159 (80.3%) | 213 (84.2%) | 325 (82.9%) | 105 (79.5%) | 220 (84.6%) |
| Administrator | 27 (6.0%) | 12 (6.1%) | 15 (5.9%) | 23 (5.9%) | 8 (6.1%) | 15 (5.8%) |
| Counselor | 21 (4.7%) | 9 (4.5%) | 12 (4.7%) | 25 (6.4%) | 10 (7.6%) | 15 (5.8%) |
| Support Staff | 20 (4.4%) | 13 (6.6%) | 7 (2.4%) | 13 (3.3%) | 7 (5.3%) | 6 (2.3%) |
| Instructional Coach/Curriculum Coordinator | 3 (0.7%) | 3 (1.5%) | 0 (0%) | 2 (0.4%) | 0 (0.0%) | 2 (0.8%) |
| Other | 8 (1.8%) | 2 (1.0%) | 6 (2.4%) | 4 (1.0%) | 2 (1.5%) | 2 (0.8%) |
| Total | 451 (100%) | 198 (100%) | 253 (100%) | 392 (100%) | 132 (100%) | 260 (100%) |

In addition to surveying treatment schools, we asked administrators in 53 comparison schools to complete the survey. We identified a total of 53 comparison schools that were similar to SECEP treatment schools on various demographic and performance characteristics. Using data from the 2012-13 school year, we matched schools on characteristics such as school size, poverty percentage, minority percentage, graduation rates, and student test scores. Administrators from 28 comparison schools responded to the survey in the spring of 2015 and 32 comparison schools responded in the spring of 2018. A total of 18 administrators provided data at both points in time. The response rate for comparison schools was 51% in 2015 and 60% in 2018.

### *Staff Survey Analyses Techniques*

In the study, we looked at changes over time for the program schools and then also compared the program schools to comparison schools. The analytic approaches differed.

***Program School Analysis Methodology.*** We looked at changes over time (for SECEP schools only) using a mixed-effects analysis of variance (ANOVA). One analytic challenge was that, because the survey was anonymous, we could not determine whether the same teachers responded at the different time points, making it impossible to link survey results to an individual participant across time. Therefore, we were unable to account for the correlation

between survey responses across the two administrations, as is typically the case with repeated-measures analysis. However, because survey responses were tracked at the school level, we were able to control for the fact that respondents were nested within schools. To account for the fact that respondents were nested within schools, we used mixed-effects ANOVAs for analysis of scales where survey administration (spring 2015 vs. spring 2018) was entered into the model as a fixed effect and school ID was entered as a random effect. We used contingency table analysis with Chi square tests for items with categorical response options. Inferential statistics were calculated for comparisons of every item and scale in the reported tables. Statistically significant effects at the item and/or scale level were noted.

***Program and Comparison School Principal Survey Analysis Methodology.*** For SECEP/comparison school analyses, one administrator response per school was selected. In order to identify an administrator at each program school for this analysis, when multiple administrators completed the survey, we used data from the administrator with the most years of service at a program school. In the event that an administrator at a program school did not complete a survey, we used data from the school counselor, when available, because counselors answered most of the same items that were designated for administrators.

To compare results between treatment and comparison schools, we used an ANCOVA, where item and scale values from the second survey administration served as the dependent variable. Item and scale values from the first survey were then entered as covariates in the analysis to control for previous levels of the constructs under investigation. For items with binary (yes/no) outcomes, we used contingency table analysis with Chi square tests and did not conduct SECEP/comparison contrasts.

## Site Visit Methodology

Site visits were conducted in the spring of 2016 and the spring of 2018. These site visits were designed to explore what implementation looked like in practice and identify any lessons learned by school staff.

### *Sample*

In both 2016 and 2018, the evaluation team visited the same sample of 12 schools in 8 districts in Connecticut and Michigan. All schools for the site visits were purposively selected by project and ISD staff to be schools that would provide useful information relative to implementation. In Bridgeport, the team visited two of the three high schools participating in the grant and two middle schools. In each of the four ISDs in Michigan, the team visited one high school and one middle school. In Lapeer, Genesee, and Delta-Schoolcraft ISDs, the middle school and the high schools were parts of different local districts; in Washtenaw, the high school and middle school were in the same local district. In each middle school, the team interviewed the principal and

one science and one math teacher. In each high school, the team interviewed the principal, a counselor, a group of 6-8 students, and one science and one math teacher. The principal was asked to select teachers who had received SECEP professional development or coaching. For the student focus groups, the principal selected students who had taken college-level courses. Additionally, the team interviewed (1) the person leading the SECEP initiative at the local district; (2) the coach (SECEP, STEM, or instructional, if available) working with the schools; and (3) a college partner representative. In 2016, a total of 63 adults and 41 students were interviewed and in 2018, a total of 61 adults and 33 students were interviewed.

***Measures and Procedures***

The interview protocols were designed to gather participants' perspectives on the two major areas of implementation: (1) the key partner and district-level implementation strategies and (2) the SECEP Design Principles. Participants were asked to describe key lessons learned relative to implementation. During the first round of site visits (2016), participants were asked about short-term impacts of the program. In the second round of site visits (2018), participants were asked about: perceived impacts of the program on teachers and students, impacts of the program on school culture, their views on sustainability of the project goals and activities, and recommendations for the future projects. During the second round of interviews, participants were also asked to respond to two mini-surveys, one on perceived impacts of SECEP on school culture and a second on the factors affecting sustainability. Participants then commented on their responses. A crosswalk with sample interview questions is provided in Appendix B. The interviews were recorded and transcribed.

***Analyses***

The evaluation team analyzed the interview transcripts to identify responses relevant to pre-specified topics such as sustainability or each of the STEM Early College Design Principles. ATLAS.ti software was used to further code themes of responses within each topic. Results were then summarized, first at the level of the individual schools, then districts, ISDs, and then for Michigan and Bridgeport. Where appropriate, results were further summarized across the entire project.

***Additional Interviews***

In addition to the interviews that occurred as part of the site visits, we conducted annual interviews with project and district staff that were designed to describe implementation to date and capture lessons learned and recommendations. These interviews used the same analysis procedures described above.

## Student Impact Study

The SECEP evaluation was designed to assess the impact of the SECEP Model on relevant student outcomes. The student impact study used a quasi-experimental design in which SECEP treatment schools were matched to schools that had similar baseline demographic characteristics and performance outcome measures. The study then compared outcomes for treatment schools with outcomes for those comparable schools.

The original intent of the study was to obtain de-identified student-level data from Michigan and Connecticut and combine the two sets of data to create an overall program-wide impact estimate for SECEP. As will be described in the impact section on Michigan, we did obtain access to Michigan student-level data and were able to run most analyses as originally planned. However, we were not granted access to student-level or customized school-level data for Connecticut; as a result, we needed to use publicly available school-level data that restricted our choice of variables and required a different matching and analytic approach. We therefore present the student findings as two separate impact studies in two separate report subsections, one for Michigan and one for Connecticut. The detailed methodology for each state is reported within the relevant section.

## SECTION IV: IMPLEMENTATION OF THE STEM EARLY COLLEGE DESIGN PRINCIPLES

The activities described in Section II were designed to assist schools in implementing the STEM Early College Design Principles. This section summarizes findings relative to the four Design Principles using data from surveys, interviews, and site visits.

### STEM College-Focused Academic Program (Design Principle #1)

The first Design Principle has a focus on STEM and consists of multiple components designed to create learning environments that prepare students for college and career. The specific components—(1) college-level courses, including STEM-focused pathways, (2) activities to support college readiness, and (3) improved instructional practice—are summarized below.

#### College-Level Courses Including STEM Pathways

To implement this part of the first Design Principle, districts committed to engaging 90% of students in receiving at least one college credit and to creating four- or five- year academic programs that included high school and college-level coursework.

From Year 1 to Year 4, administrators reported significant increases in all measures of enrollment in college preparatory and college-level courses and in STEM pathways, with many of these increases being detected starting in Year 3. Of particular note, in Year 1, only 2.3% of administrators reported that 75% or more of students in their schools were on track to earn any college credit. By Year 4 this number had risen to 29%. Similarly, in Year 1, only 7.2% of administrators reported that 75% or more of students were enrolled in STEM pathways, but by Year 4 this number had risen to 31%. Full results are available upon request.

Finally, compared to administrators in matched-comparison schools, SECEP administrators reported statistically significantly higher percentages of students enrolled in dual enrollment courses and in STEM pathways and a higher percentage of students on track to meet minimum university admission standards. SECEP administrators also reported higher percentages of students on track to meet minimum admission standards for the state university system, but this difference was not statistically significant.

*Table IV-1. Student Enrollment in College Preparatory and Dual Enrollment Courses*

| This school year, what percentage of your students: | Respondent | Level of Analysis | First Survey (2015) | | | Fourth Survey (2018) | | | Change | Adj. Mean | Impact Estimate |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | n | Mean | SD | n | Mean | SD | | | |
| Are on track to meet minimum admission standards for the state university system? | Program Administrators | All Schools | 43 | 3.63 | 1.3 | 39 | 4.33 | 1.1 | 0.71** | -- | -- |
| | | CT | 19 | 3.05 | 0.9 | 15 | 4.47 | 1.0 | 1.41** | -- | -- |
| | | MI | 24 | 4.08 | 1.3 | 24 | 4.25 | 1.1 | 0.17 | -- | -- |
| | Program vs. Comparison Administrators | Program | 10 | | | | | | | 4.44 | 0.35 |
| | | Comparison | 18 | | | | | | | 4.09 | |
| Are on track to earn any college credits while in high school? | Program Administrators | All Schools | 43 | 2.42 | 0.8 | 41 | 3.66 | 1.5 | 1.24** | -- | -- |
| | | CT | 19 | 2.32 | 0.6 | 16 | 3.31 | 1.5 | 1.00* | -- | -- |
| | | MI | 24 | 2.50 | 0.9 | 25 | 3.88 | 1.5 | 1.38** | -- | -- |

| This school year, what percentage of your students: | Respondent | Level of Analysis | First Survey (2015) | | | Fourth Survey (2018) | | | Change | Adj. Mean | Impact Estimate |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | n | Mean | SD | n | Mean | SD | | | |
| | Program vs. Comparison Administrators | Program | 11 | | | | | | | 3.85 | 0.98* |
| | | Comparison | 18 | | | | | | | 2.87 | |
| Are on track to earn 12+ college credits while in high school? | Program Administrators | All Schools | 43 | 2.02 | 0.8 | 42 | 2.90 | 1.0 | 0.88** | -- | -- |
| | | CT | 19 | 1.79 | 0.7 | 16 | 3.06 | 1.0 | 1.27** | -- | -- |
| | | MI | 24 | 2.21 | 0.8 | 26 | 2.81 | 0.9 | 0.60† | -- | -- |
| | Program vs. Comparison Administrators | Program | 11 | | | | | | | 2.90 | 0.73* |
| | | Comparison | 18 | | | | | | | 2.17 | |
| Are enrolled in a pathway or sequence of high school and college courses leading to college STEM majors? | Program Administrators | All Schools | 42 | 2.88 | 1.1 | 42 | 3.81 | 1.3 | 0.93** | -- | -- |
| | | CT | 18 | 2.83 | 1.0 | 16 | 4.56 | 1.5 | 1.73** | -- | -- |
| | | MI | 24 | 2.92 | 1.2 | 26 | 3.35 | 1.2 | 0.43 | -- | -- |
| | Program vs. Comparison Administrators | Program | 11 | | | | | | | 3.66 | 0.95* |
| | | Comparison | 18 | | | | | | | 2.71 | |

Note. * p < .05; ** p < .01; † p < .10

During interviews conducted over the course of the project, participants were asked to describe their school's efforts to expand access to college courses for more students and to create STEM and other pathways that span high school and college courses. Their responses are summarized below, by state. A list of the pathways existing in both states by the end of the grant can be found in Appendix C.

***Bridgeport***

Over the course of the project, both the middle and high schools reported undertaking activities designed to increase student access to college courses. At the middle schools, these efforts focused on improving students' readiness for high school and, at the high schools, efforts focused on expanding access to college-level courses.

There were efforts at both Bridgeport middle schools to provide algebra courses in the 8th grade so that students could take geometry earlier in high school and have opportunities to take advanced or college-level math as juniors or seniors.

At the two Bridgeport high schools we visited, college-level courses were accessed by students in a variety of ways, including Advanced Placement (AP) and International Baccalaureate (IB) courses, college-level courses taught by high school faculty, and dual enrollment courses taught at the partner colleges. Students at one high school described that they could take up to seven different AP courses and that the AP and Honors courses were challenging.

At one high school, college courses were taught by high school teachers certified as adjunct faculty through the University of Connecticut. Other courses were taught at partner colleges. An administrator described a sense of pride that their teachers were becoming certified,

> We were very proud of our teachers for taking this step. They are able to attend the course over the summer, to receive the certification, and they are here and once they receive this certification they are in a position to be able to teach a course.

A staff member at the same school referenced the growth in enrollments in college courses taught at the school by the college-certified faculty, "Last year we had approximately 14 students who had exposure. This year we had all the way up to 83 (11th- and 12th-grade) students with exposure to these courses." Another staff member also described the sharp increase in number of students taking college courses,

> In the whole state, we had the second highest increase in college courses in our high school through UCONN [University of Connecticut]. There was only one other school that had a higher percentage than us.... I think that our students are performing well in these college-level courses so then, in turn, they want to take more of those courses.

Although staff reported that the number of courses available to students had increased due to certification of adjunct faculty, the number of pathways available to students remained the same. In the final year, two high school staff commented that the number of available courses, and the number of students taking these courses, should be increased in order to strengthen their impact.

At the second high school, access to college courses had increased through new postsecondary partnerships and pathways. By the end of the grant, the school provided access to college courses through an Advanced Manufacturing pathway with a local community college to 16 students per cohort, and through a Health Sciences pathway with a private college affiliated with a local medical center, to 12 students per cohort. Three additional pathways were in the development stage: Environmental Science, Culinary Arts, and Law Enforcement.

A participant described seeing students at this second high school beginning to embrace a college culture, "Yeah, I see a lot of students wanting to take college classes now" and "I do see that the students are coming around more to the idea of college and creating that piece here, as you were saying, as a culture." Despite this, a different interviewee remarked that, while access to courses was increasing, it was not yet embraced as a major offering, nor a vision, for this school, "I feel like it's gradually growing but it's not communicated as like, 'this is our vision,' 'that's what we're doing.'"

***Michigan***

Michigan had a supportive policy environment for expanding access to college courses, including legislation that supported both Early and Middle Colleges, which allowed high school students to stay for a fifth year to take college courses free of charge. All four of the ISDs in the project took advantage of this legislation to either create or expand their Early Colleges over

the life of the project. Each of these Early/Middle College Programs had pathways associated with them, including pathways leading to Associates degrees and technical career certificates.

College coursetaking also expanded beyond students in Early/Middle College Programs over the course of the project. A principal in one school said, “We have data that show that every single year since this project started, our numbers for dual enrollment..., they've increased every year. We have more students enrolling in classes.”

One way schools tried to increase enrollments was by specifically targeting non-traditional college-bound students, as was discussed by two individuals we interviewed, “We're really working on it this year as we've put more students into college classes who are not your top students, more of our average students...” and “It used to be that it was more just your university-bound type student. Now, we've reached out and [tried] to encompass more students, more of our at-risk population.”

Districts also tried to broaden access to college courses for more students through a specialized “student success course,” which provided students with opportunities to learn about the college experience, expectations, and strategies for college success. In two ISDs, the student success course was offered for one college credit, and in some schools, it was offered to almost all students in a targeted grade level. One stakeholder said, “The biggest impact was the opportunity for students to gain college credits. The [student success course], the fact that everybody leaves with a credit is cool.” According to one student’s description, “The class that we took for the college, that's where we learned like how to take notes for our upcoming college classes. I feel like that prepared us a little bit for what's going to come in the future.” Students in one school who had taken the course described it as “helpful in figuring out what they wanted to do.”

Expanding access to college courses meant some schools faced logistical or financial challenges. For example, schools in two districts noted the need to pay attention to finding high school staff who could be certified to teach college courses. As one school leader noted, “We began the process of looking at our own staff and their skill levels and their abilities and expanding to seek adjunct status at the college.” One of the local districts said that they struggled with college courses because of the physical distance to their postsecondary partner; as a result, this district also sought out online courses and ways to offer the college courses on their own campus.

A core expectation of the grant was to align high school and college courses into pathways. Each Michigan district created pathways with the content of those pathways depending on (1) the capacities of the schools to provide college content, (2) their alignment to pathways or degrees offered at the partner IHE, (3) local career demands, and (4) students’ interest in particular career fields. For example, one local district had an Advanced Manufacturing

pathway for which students could receive 8 to 10 college credits, a nursing pathway, and was also in the process of developing a childcare pathway. In one of the Middle Colleges, the pathways were aligned to give students the general education courses needed for an associate degree. In this school, all students took the same transferrable courses in their junior year, transferable electives in their senior year, and courses in their concentration area during the 13th year. In another school, the pathways were described as more individualized whereby the staff worked with students to identify their career plans and then helped them to develop an individual plan or pathway that met those career needs, often through different means (e.g., dual enrollment, CTE, or AP courses). The counselor then worked with their college counterparts to help each student understand what courses will help them achieve goals through high school and into college.

Although dual enrollment was the emphasis of the grant, AP classes was another mechanism for getting college credit. As one district leader commented, "I know the AP classes are not the college experience. We understand that, but to us, it's one step in between, and we've never offered as much as we have now." In one of the schools, however, staff noted that AP offerings were reduced, because eligible students preferred dual enrollment courses.

***Program-Wide Summary***

In summary, by the final year of the project, districts in both states were working to expand access to college courses. In Michigan, each ISD had at least one Early/Middle College, which provided extensive access for the students enrolled in that school. Across both states, schools had students enrolled in STEM-focused pathways that spanned high school and college often in engineering, information technology, medical fields, or advanced manufacturing areas. Schools in neither state, however, were close to reaching the SECEP project goal of having 90% of their students receiving at least one college credit.

## College Readiness Activities

Part of the College Ready Academic Program Design Principle includes activities designed to increase students' college readiness, such as their (1) academic preparedness; (2) college aspirations and awareness of available options; (3) ability to take responsibility for their own learning; (4) knowledge of the college application process and ability to navigate college culture and advocate for themselves; and (5) academic college skills (i.e., time management, notetaking, organizational and study skills).

The staff survey looked at schools' support for college readiness in three different ways: the level of College-Going Expectations, the incorporation of College Readiness Goals, and the instruction in College Readiness Skills. Results from the survey show significant positive changes between the first and final administration of the survey in teachers' and administrators'

responses on all three scales. In addition, SECEP administrators reported more positive responses than administrators in comparison schools on all three scales. However, these observed differences between treatment and comparison administrators were only statistically significant for the College-Going Expectations and College Readiness Skills scales.

*Table IV-2. College Readiness Scales*

| Scale | Respondent | Level of Analysis | First Survey (2015) | | | Fourth Survey (2018) | | | Change | Adj. Mean | Impact Estimate |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | n | Mean | SD | n | Mean | SD | | | |
| College Readiness Goals | All Program Teachers | All Schools | 353 | 2.69 | 0.7 | 312 | 2.89 | 0.7 | 0.19** | -- | -- |
| | | CT | 149 | 2.61 | 0.6 | 97 | 2.94 | 0.8 | 0.33** | -- | -- |
| | | MI | 204 | 2.76 | 0.7 | 215 | 2.86 | 0.7 | 0.10 | -- | -- |
| | STEM Program Teachers | All Schools | 151 | 2.65 | 0.7 | 140 | 2.81 | 0.7 | 0.16* | -- | -- |
| | | CT | 60 | 2.57 | 0.7 | 40 | 2.78 | 0.8 | 0.21 | -- | -- |
| | | MI | 91 | 2.70 | 0.7 | 100 | 2.82 | 0.6 | 0.12 | -- | -- |
| | Program Administrators | All Schools | 43 | 2.77 | 0.8 | 44 | 3.18 | 0.7 | 0.41* | -- | -- |
| | | CT | 19 | 2.70 | 0.7 | 16 | 3.26 | 0.8 | 0.56 | -- | -- |
| | | MI | 24 | 2.78 | 0.8 | 28 | 3.13 | 0.6 | 0.35† | -- | -- |
| | Program vs. Comparison Administrators | Program | 12 | | | | | | | 3.21 | 0.47 |
| | | Comparison | 18 | | | | | | | 2.74 | |
| College-Going Expectations | All Program Teachers | All Schools | 330 | 2.89 | 0.6 | 302 | 3.18 | 0.5 | 0.29** | -- | -- |
| | | CT | 136 | 2.74 | 0.6 | 93 | 3.09 | 0.6 | 0.35** | -- | -- |
| | | MI | 194 | 2.99 | 0.5 | 209 | 3.22 | 0.5 | 0.23** | -- | -- |
| | STEM Program Teachers | All Schools | 143 | 2.86 | 0.6 | 136 | 3.08 | 0.6 | 0.22** | -- | -- |
| | | CT | 57 | 2.70 | 0.6 | 39 | 2.88 | 0.6 | 0.19 | -- | -- |
| | | MI | 86 | 2.97 | 0.5 | 97 | 3.15 | 0.5 | 0.19* | -- | -- |
| | Program Administrators | All Schools | 41 | 2.98 | 0.5 | 43 | 3.37 | 0.5 | 0.39** | -- | -- |
| | | CT | 17 | 2.84 | 0.5 | 16 | 3.31 | 0.6 | 0.47* | -- | -- |
| | | MI | 24 | 3.08 | 0.5 | 27 | 3.41 | 0.5 | 0.32* | -- | -- |
| | Program vs. Comparison Administrators | Program | 12 | | | | | | | 3.47 | 0.41* |
| | | Comparison | 17 | | | | | | | 3.06 | |
| College Readiness Skills | All Program Teachers | All Schools | 321 | 3.58 | 0.9 | 299 | 3.84 | 0.8 | 0.26** | -- | -- |
| | | CT | 134 | 3.54 | 0.9 | 91 | 3.87 | 0.9 | 0.33* | -- | -- |
| | | MI | 187 | 3.60 | 0.9 | 208 | 3.82 | 0.8 | 0.22** | -- | -- |
| | STEM Program Teachers | All Schools | 139 | 3.64 | 0.8 | 137 | 3.87 | 0.8 | 0.23* | -- | -- |
| | | CT | 57 | 3.50 | 0.9 | 40 | 3.96 | 0.9 | 0.46* | -- | -- |
| | | MI | 82 | 3.73 | 0.8 | 97 | 3.83 | 0.8 | 0.10 | -- | -- |
| | Program Administrators | All Schools | 40 | 2.93 | 0.8 | 43 | 3.59 | 0.9 | 0.66** | -- | -- |
| | | CT | 16 | 2.81 | 0.9 | 16 | 3.83 | 0.9 | 1.02** | -- | -- |
| | | MI | 24 | 3.01 | 0.7 | 27 | 3.45 | 0.8 | 0.44* | -- | -- |
| | Program vs. Comparison Administrators | Program | 12 | | | | | | | 3.72 | 0.83** |
| | | Comparison | 18 | | | | | | | 2.89 | |

Note. * p < .05; ** p < .01; † p < .10

For the College Readiness Goals scale, in 2018, staff believed that, on average, it was "mostly true" that the school pursued students' college readiness goals, with 79% of teacher and 86% of administrators (respectively) "mostly" or "entirely" agreeing that their school had clearly articulated goals for academic college readiness. Teachers reported statistically significant increases on three of the four items used in this scale with use of rubrics to measure college readiness being the only area evidencing little change.

Relative to college-going expectations, on average 75% to 100% of staff "agreed" or "strongly agreed" in 2018 that their schools helped students with their postsecondary aspirations and plans. There were positive changes across time for all groups with much of this change being detected starting in Year 3. On average, in 2018, staff reported working on students' college readiness skills approximately once a week. There were positive changes across time for all groups, with significant increases for teachers and administrators.

Table IV-3 reports results on whether schools conducted activities that encouraged students to think of themselves as students who can succeed in a postsecondary institution.[2] In 2018, approximately 74% of teachers and 88% of administrators reported that their school was trying to improve students' self-image related to their postsecondary academic success. As Table IV-3 also shows, there were positive increases for all teachers and Michigan administrators between 2015 and 2018.

*Table IV-3. Activities to Encourage Students to Think of Themselves as Being Able to Succeed in a Postsecondary Institution*

| Item | Respondent | Level of Analysis | First Survey (2015) | | Fourth Survey (2018) | | Change |
|---|---|---|---|---|---|---|---|
| | | | n | % Yes | n | % Yes | |
| Does your school conduct activities designed to get all students to think of themselves as students who can succeed in a postsecondary institution? | All Program Teachers | All Schools | 324 | 62.0 | 293 | 74.4 | 12.4** |
| | | CT | 134 | 59.7 | 90 | 73.3 | 13.6* |
| | | MI | 190 | 63.7 | 203 | 74.9 | 11.2* |
| | STEM Program Teachers | All Schools | 140 | 59.3 | 133 | 70.7 | 11.4* |
| | | CT | 56 | 60.7 | 38 | 65.8 | 5.1 |
| | | MI | 84 | 58.3 | 95 | 72.6 | 14.3* |
| | Program Administrators | All Schools | 40 | 82.5 | 43 | 88.4 | 5.9 |
| | | CT | 16 | 87.5 | 16 | 87.5 | 0.0 |
| | | MI | 24 | 79.2 | 27 | 88.9 | 9.7 |
| | Program vs. Comparison Administrators | Program | 12 | 66.7 | 12 | 91.7 | 25.0 |
| | | Comparison | 18 | 88.9 | 18 | 88.9 | 0.0 |
| Does your school provide supports for developing students' college knowledge (that is knowing how to prepare for college academically and behaviorally)? | All Program Teachers | All Schools | 312 | 73.1 | 290 | 84.1 | 11.0** |
| | | CT | 132 | 68.2 | 89 | 85.4 | 17.2** |
| | | MI | 180 | 76.7 | 201 | 83.6 | 6.9† |
| | STEM Program Teachers | All Schools | 137 | 69.3 | 133 | 84.2 | 14.9* |
| | | CT | 55 | 69.1 | 38 | 84.2 | 15.1† |
| | | MI | 82 | 69.5 | 95 | 84.2 | 14.7* |
| | Program Administrators | All Schools | 40 | 80.0 | 42 | 92.9 | 12.9† |
| | | CT | 16 | 93.8 | 16 | 87.5 | -6.3 |
| | | MI | 24 | 70.8 | 26 | 96.2 | 25.4* |
| | Program vs. Comparison Administrators | Program | 12 | 66.7 | 12 | 91.7 | 25.0 |
| | | Comparison | 17 | 64.7 | 18 | 100.0 | 35.3 |

Note. * p < .05; ** p < .01; † p < .10

[2] Note that the table does not report on the statistical significance of the SECEP/comparison contrast because Yes/No questions used contingency table analysis with Chi square tests, as described in the Methodology section.

Table IV-3 also shows that approximately 84% of teachers and 93% of administrators reported that the school provided supports for developing students' college knowledge. Results show positive changes between 2015 and 2018 for all teachers and Michigan administrators.

During the interviews, participants were asked to describe their school's efforts over the course of the program to improve students' college readiness skills. In both states, interviewees talked about activities to improve students' (1) academic preparedness; (2) "soft skills," (i.e., time management, notetaking, organizational and study skills) and ability to take responsibility for their own learning; (3) college aspirations and awareness of available options; and (4) college knowledge (i.e., knowledge of the college application process and ability to navigate college culture and advocate for themselves). Their responses are summarized by state.

***Bridgeport***

College readiness activities in Bridgeport middle schools focused primarily on academic preparedness and college and career awareness and aspirations. Academic preparedness at both middle schools included increasing the rigor of instruction in pre-algebra and algebra in the 8th grade because that was identified as an area that was holding students back. At one middle school, comprehensive tutoring and after-school academic assistance were implemented to help students be successful as they enter high school.

Students at the two middle schools we visited were introduced to college as early as the 6th grade through college visits and use of the Naviance software. As one staff member noted,

> [We're] trying to get our students ready for college at an earlier stage. Normally, in the past, we were just thinking high school, but now we have to think a little bit further. We have to have our kids prepared because, to be honest, our students are underrepresented at the college level.

The high schools addressed academic readiness by assessing students' performance in math and English, administering PSAT and SAT tests, offering credit recovery and SAT prep courses, after-school tutoring, and incorporating SAT prep into their regular classes. When asked whether their school prepared them well for college academically, students had mixed responses. Some believed that their regular classes did not prepare them well, while AP classes were more rigorous and prepared them for college-level classes. As one student commented, "I'd say the school didn't so much academically prepare me for college, as it did more on a social level, like a more mental level. Like, it's helped with my maturity and stuff like that."

College aspiration activities at the two high schools included career and college exploration courses and activities, college recruitment visits to high schools, and campus visits by students. Staff in both Bridgeport high schools described the use of the Naviance career guidance software to prepare students to be successful in high school and post-secondary work or

school. The effort made at the 9th-grade level in both schools was to help students adjust to high school, develop good academic habits, and, as one staff member put it, "start that [readiness] conversation." The focus was on

> ...what does it mean to be a high school student, what kind of expectations do we have and exposing [students] to some information of what do they need to graduate and how it's going to help them most in terms of being college ready.

The goal was to show students how to make better decisions about college and what behaviors are necessary to be college ready.

Both high schools introduced a course focused on academic college skills (sometimes referred to as soft skills) and college knowledge. At one school, the freshman seminar course was delivered by faculty from the local community college and was designed to familiarize 9th- and 10th-grade students with course syllabi, time management, and self-advocacy. Twenty-nine (29) students took part in this freshman seminar in 2017-18. At the other high school, the Career and College Readiness class was designed to be taken by 11th- and 12th-grade students during the first period of the day. Teachers from several content areas provided instruction for this class; it focused on "...time management skills, the basic responsibilities about how to become a student," and counselors would then "work content into the class."

Teachers remarked that they have seen changes in students who have come through the college readiness activities in the last few years. Students who had never thought they would attend college, now think of themselves as college-going, as one teacher stated, "Some of my first-year students that are now seniors, say things like, 'I didn't think I was going to go to college and I got into college.'" One stakeholder also described the changes in students,

> They are feeling that they can accomplish and achieve more than maybe they thought they could when they started the year, or came here, or whenever. I noticed that they take more pride in their work. I have more students who want to finish. I have students who say, "I didn't quite get it all done" instead of feeling that every class problem or work they're working on is a grade then-and-there, and punitive.

***Michigan***

Similar to Bridgeport, college readiness activities in Michigan middle schools focused primarily on academic preparedness and college and career awareness and aspirations. Stakeholders in all four ISDs shared that, in middle school, many students performed poorly, especially in math, and thus entered high school unprepared. In three of the four ISDs, there were efforts to bring students' math skills up so that some of them could take Algebra I courses in 8th grade, which would allow them to access college courses in later grades.

With regard to college aspirations activities, staff at two of the four ISDs described opportunities for middle school students to visit colleges. Other schools had aspirational

activities that included college fairs or college nights, alumni or community speakers, and "college days." One interviewee described activities at the middle school, saying, "We have 'wear your jersey day' during football season, and staff and faculty make it known where they went to college, and why they chose to go to school there." Another staff member described daily conversations, "We don't say, 'Are you going to college?', we say 'What college are you going to?' So, college is talked about quite a bit."

Across all four ISDs, students began developing their plans for high school and beyond starting in middle school. Stakeholders at two ISDs described 8th-grade students working with staff to develop their Educational Development Plan. Students used and updated these plans for career and college exploration throughout high school. One middle school offered a class for college and career readiness for their 8th-grade students. In another school, college and career exploration was part of a daily advisory program.

At the high school level, schools focused on developing different aspects of students' college readiness. One ISD was intensely focused on high school students' academic preparation. They increased the frequency and number of students being tested in reading and writing and prepared more students for Accuplacer. They offered a remediation college lab, various after-school academic programs, and increased the number of students in their summer bridge program to prepare students for college-level courses both academically and socially.

In three ISDs, schools offered a college readiness seminar (for one college credit in two of these three ISDs). The seminar provided instruction on academic college skills, college expectations, and navigating college procedures. One counselor at a different ISD described a change in students who have participated in the seminar,

> It causes students to do some thinking...about their future and [we've] had the compliment many times from our counselors that students in 10th grade now are starting to come down and ask some really good questions about their futures and careers very early. [Students are] starting to get concerned about these things and they do other things as well in the course like looking at the differences between high school and college.

In one ISD, a participant described that teachers embedded career exploration in their regular subject classes, while in another ISD, teachers described embedding soft skills into their curriculum and grading college readiness as a separate skill,

> We've added an extra column to our grade book that it's basically a "college readiness" column so that teachers are able, [for] every single student that teacher has, [to] go in and put in a grade. It's a letter grade just saying whether or not they're college ready, they're moving to be college ready, or they're not quite there yet, as well as notes on what they can work on, social skills, turning in assignments on time, and stuff like that.

### *Program-Wide Summary*

In summary, all middle and high schools in both states focused on academic preparedness and college and career awareness and aspirations. Additionally, high schools in both states offered a variation of a college readiness course, focused on academic college skills ("soft skills") and college knowledge. Some schools taught these skills in a separate class whereas others embedded them in regular subject classes. Students in both states found these classes helpful.

## Improved Instructional Practice

SECEP also had a strong emphasis on improving instruction to prepare students for success in college and STEM fields. Table IV-4 shows the results of two survey scales characterizing Rigorous Instructional Practices and Inquiry/Project-Based Learning Practices. Results show overall positive, but not always statistically significant, changes over time on both scales. STEM teachers reported larger changes in both instructional practices than all teachers combined. By the final survey administration, teachers in both states reported using Rigorous Instructional Practices, on average, once or twice per week and Inquiry/Project-Based Learning Practices, on average, once or twice per month. On both scales, SECEP administrators reported a higher frequency of teachers' use of these practices than did teachers themselves. Finally, most of the statistically significant changes in both scales over time were detected during the final year of the survey, suggesting that bringing about instructional changes was a slow process.

*Table IV-4. Instructional Scales*

| Scale | Respondent | Level of Analysis | First Survey (2015) | | | Fourth Survey (2018) | | | Change | Adj. Mean | Impact Estimate |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | N | Mean | SD | n | Mean | SD | | | |
| Rigorous Instruction | All Program Teachers | All Schools | 340 | 3.83 | 0.8 | 305 | 3.95 | 0.8 | 0.12* | -- | -- |
| | | CT | 142 | 3.94 | 0.8 | 93 | 4.09 | 0.7 | 0.14 | -- | -- |
| | | MI | 198 | 3.74 | 0.8 | 212 | 3.89 | 0.8 | 0.15* | -- | -- |
| | STEM Program Teachers | All Schools | 146 | 3.70 | 0.8 | 139 | 3.98 | 0.7 | 0.28** | -- | -- |
| | | CT | 58 | 3.73 | 0.8 | 39 | 3.98 | 0.8 | 0.25 | -- | -- |
| | | MI | 88 | 3.68 | 0.8 | 100 | 3.98 | 0.7 | 0.30** | -- | -- |
| | Program Administrators | All Schools | 25 | 3.81 | 0.6 | 21 | 4.18 | 0.5 | 0.37* | -- | -- |
| | | CT | 12 | 3.90 | 0.7 | 8 | 4.15 | 0.6 | 0.25 | -- | -- |
| | | MI | 13 | 3.77 | 0.6 | 13 | 4.21 | 0.5 | 0.44† | -- | -- |
| | Program vs. Comparison Administrators | Program | 11 | | | | | | | 4.10 | 0.56** |
| | | Comparison | 18 | | | | | | | 3.54 | |
| Inquiry/ Project-Based Learning | All Program Teachers | All Schools | 340 | 2.99 | 0.7 | 306 | 3.14 | 0.7 | 0.16** | -- | -- |
| | | CT | 142 | 3.06 | 0.8 | 94 | 3.22 | 0.8 | 0.15 | -- | -- |
| | | MI | 198 | 2.93 | 0.7 | 212 | 3.11 | 0.7 | 0.18** | -- | -- |
| | STEM Program Teachers | All Schools | 146 | 2.84 | 0.7 | 140 | 3.11 | 0.8 | 0.27** | -- | -- |
| | | CT | 58 | 2.82 | 0.7 | 40 | 3.17 | 0.9 | 0.35* | -- | -- |
| | | MI | 88 | 2.86 | 0.7 | 100 | 3.09 | 0.7 | 0.23* | -- | -- |
| | Program Administrators | All Schools | 25 | 3.64 | 0.6 | 21 | 3.97 | 0.5 | 0.34* | -- | -- |
| | | CT | 12 | 3.70 | 0.6 | 8 | 3.86 | 0.6 | 0.16 | -- | -- |
| | | MI | 13 | 3.57 | 0.5 | 13 | 4.04 | 0.5 | 0.47* | -- | -- |
| | Program vs. Comparison Administrators | Program | 11 | | | | | | | 3.93 | 0.50* |
| | | Comparison | 18 | | | | | | | 3.43 | |

Note. * p < .05; ** p < .01; † p < .10

During interviews, participants were asked to describe their school's efforts over the course of the project to change STEM instruction, and instruction in other subjects. Their responses are summarized separately for each state.

***Bridgeport***

Early in the project, Bridgeport brought focus to their STEM curriculum by pushing for greater technology integration into math and science classrooms. SECEP district leaders identified a cohort of math and science teachers from all of the SECEP high schools to receive professional development from Teachers College instructors, some of which was about integrating technology into the science classrooms and some about project-based learning strategies.

Over the life of the project, the district also focused on implementation of the Common Instructional Framework (CIF), six instructional strategies designed to increase students' engagement in learning (see box). By the time of the interviews with district and school staff in Year 4, 15 participants reported that instruction had changed at the middle and high schools in Bridgeport as a result of the project. All seven interviewed teachers described their increased use of CIF strategies in their classrooms. Three teachers specifically described how they changed their instruction to include increased use of collaborative groups, classroom talk, and writing to learn. Teachers stated that students were more engaged as CIF strategies became part of the classroom and that students were able to learn more in depth, as one teacher said, "I see a student that understood something and now is able to explain it maybe at a simpler level. That's challenging. You understand something that's complicated, and you can explain it at a simple level, that's intelligence."

**The Six Strategies of the Common Instructional Framework (Jobs for the Future, 2012)**

**Collaborative Group Work:** Collaborative Group Work brings students together in small groups for the common purpose of engaging in learning.

**Writing to Learn:** Writing to Learn enables students to experiment every day with written language and to increase their fluency and mastery of written conventions.

**Scaffolding:** Scaffolding helps students connect prior knowledge and experience with new information and ideas.

**Questioning:** Questioning challenges students and teachers to use good questions as a way to open conversations and further intellectual inquiry.

**Classroom Talk:** Classroom Talk creates the space for students to articulate their thinking and strengthen their voices.

**Literacy Groups:** Literacy Groups provide students with a collaborative structure for understanding a variety of texts, problem sets, and documents by engaging in a high level of discourse.

Three teachers described how they incorporated more authentic problems into their curriculum. For example, in one STEM class, students researched careers that they were interested in and then were assigned a project that required them to explore that career and the math that was required in that field. The teacher described one student's revelation about how her chosen career actually required math,

> [Initially she said] "I'm going to be a hairdresser, I don't need to know math." And there's a whole math of creating the hair dye and that was new to me and new to her so then she became more interested in the math, "Oh, well I need to know about ratios when I mix the colors and things like that."

Three teachers reported collaborating with colleagues to develop cross-curricular lessons that would apply CIF strategies to STEM projects. The teachers have incorporated Collaborative Group Work, Scaffolding, and Writing to Learn to engage students.

Although the interviewed teacher leaders reported implementing the CIF strategies with confidence, one district leader, who often observed teachers, described CIF implementation across the schools as "uneven." One stakeholder shared that this uneven adoption may have been due to the fact that teachers lacked understanding that the strategies were to be embedded in regular classroom practice, stating, "They see it as add-on that they may or may not have time to do." According to a district leader, teachers who implemented the CIF practices effectively modified their lessons as they gained experience, and thus, they modeled persistence for their students. One teacher leader was observed working with students during the project. The observer described behaviors of the students in the class where the CIF had been implemented,

> I've observed students in those classes where teachers have taken hold of it and they make it work and they question it, and they figure out what didn't work, and they try something else. I see their students doing that [same thing]. They're seeing that you just don't walk away from things. The students start to think, "I just don't walk away from this."

While teachers in all schools described adopting CIF instructional strategies, students in both Bridgeport high schools did not always witness their implementation. In one school, the primary challenge was teacher turnover. Students described some good teachers but noted that most of these teachers had left the school. Students also described poor experiences in some classes as compared to others. For example, in another high school, students viewed their science classes as taught in much more engaging ways than their math classes. They described little interaction and a lack of CIF strategies being used in these math classes.

These results suggest that instructional change relative to the CIF and STEM-focused inquiry activities occurred with some teachers and some classrooms but that by the end of the grant instructional changes may not have been as widespread as desired.

***Michigan***

In Michigan, efforts to improve instruction were brought about by focusing primarily on project-based learning. Across all schools, teachers indicated that there had been increased development and use of projects over time with a middle school teacher describing how cross-curricular projects were implemented in their school,

> Each grade has at least one project...we have students that have geometry and biology, and they are working on building a spaghetti bridge. In science they are talking about the environmental impact of a bridge and in math we are building a bridge to see whose bridge will hold the most weight and then we're going to calculate the forces.

A middle school in another ISD made substantial changes to the master schedule so that all 7th- and 8th-grade students spent the final two periods of the day (100 minutes) in project-based learning (PBL). Before lunch, teachers incorporated STEM and projects into their classes as they liked. In the afternoon, which was required by the administration to be "100% PBL," all teachers led groups of up to 18 students in six-week-long inquiry projects. One teacher shared that this PBL was the "biggest change" in the school and said that it allowed teachers to work with smaller groups of students.

Similarly, staff in the high schools reported making changes in their instruction, also focusing more on problem- or project-based learning and inquiry. A counselor described how the science class was using more PBL,

> When I walk by [the science class] they're so engaged with their problem-based learning, and it was just cool to see because I don't think they are kids that maybe would have been as engaged in science and in math.

A high school student in the same school agreed, describing how a project helped them develop an understanding of physics concepts,

> We just did a chapter on simple machines, and we used levers and pulleys, and we're figuring out the force and how much work you end up actually doing with the use of those simple machines. And that really helped [us] understand like, yeah, you're doing more work, but the work is easier [because of the simple machine].

Because most of the projects were cross-curricular, development involved collaboration among faculty. In one district, this collaboration even occurred across schools with the middle and high school staff working together on projects. An interviewee noted that this was unusual,

> We've rarely had cross-building project work. We have done some cross-building projects where teachers have given opinions but not really influenced the work. We've had our STEM integration team, over these last several years, which has actually had middle school teachers sitting in a room with high school people developing activities for high school students; that kind of collaboration rarely happens and vice versa.

Challenges to incorporating projects on a large scale were expressed by teachers at three schools. One teacher described large variations in student knowledge and skills (e.g., accelerated math students grouped with students who are below-grade level) and how this disparity can be frustrating for teachers who are leading the groups and trying to accommodate all learners and frustrating for students who feel held back or who could not keep up. However, another teacher believed that projects helped students at different learning levels: "I think that...having nice open tasks gives an entry point for all students. Then that means that even struggling students have that opportunity to kind of interject something. They have something that they can say." Other teachers recognized that problem- or project-based learning required scaffolding. One teacher described guiding the class, "'here is what we know', 'this is what we want to know', 'how do we get there?'…ask questions, develop ideas, etc."

Another challenge noted in one school was that the school's structure made doing cross-subject projects difficult because students were not in "houses" and did not share the same teachers. Finally, staff in one school noted that implementation of projects had been on hiatus during the 2017-18 school year because of leadership turnover; however, in the hiring of a new principal, the expectation was that projects would be implemented in the upcoming academic year.

Across the Michigan schools and districts, there were a variety of STEM-oriented extracurricular experiences for students, the most common being robotics, which was offered in all of the districts. In one district, the robotics club started in middle school and continued into high school. One district highlighted participation in math and science competitions, including Science Olympiad. One district provided engineering opportunities through Project Lead the Way. One middle school had introduced the IQWST curriculum from Michigan State University, although that has led to the loss of some technology and robotics electives.

***Program-Wide Summary***

Across both states, there have been reported changes in instruction in all schools. In Bridgeport, schools implemented the CIF strategies, and in Michigan, schools focused on implementing project-based and inquiry learning. While all teachers we interviewed implemented new instructional strategies, the survey results suggest that not all teachers in the schools had embraced the changes.

## Student Support (Design Principle #2)

The Student Support Design Principle recognizes that an increasingly rigorous academic environment requires extensive academic and affective supports. As articulated by the model, these supports are expected to be collaborative with the college. Schools are also expected to support students' development of "college knowledge," including assistance in college and career planning and in the transition to college. This section describes the survey and interview results around academic and social-emotional supports, including the support provided to students around the college application process.

Before SECEP began, schools already reported high levels of supports in place. Across the life of the project, schools and districts increased their support in areas related to college readiness and students' performance in college classes. Year 3 data revealed that, compared to other Design Principles, supports for students in college-level courses lagged and had just started to gain more attention from district leaders. During that year, two districts started receiving more information from colleges about the progress of their students in college classes and as such, districts began providing supports for these students on high school campuses.

Table IV-5 reports on two different support scales from the staff survey: (1) whether there were Schoolwide Systems of Support in place, and (2) whether staff provided supports themselves. Results from the implementation survey showed inconsistent change across years on these scales. The survey showed that staff reported an overall increase in school-wide system to support students. There was also an overall increase in the extent to which school staff provided academic and social supports themselves, however, this was driven by Connecticut staff only, which was likely the result of an unrelated social-emotional program (see description in sub-section on Connecticut). Reported supports on both scales were higher in SECEP schools than in comparison schools.

*Table IV-5. Student Support Scales*

| Scale | Respondent | Level of Analysis | First Survey (2015) | | | Fourth Survey (2018) | | | Change | Adj. Mean | Impact Estimate |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | n | Mean | SD | n | Mean | SD | | | |
| School System for Academic/ Social-Emotional Support | All Program Teachers | All Schools | 331 | 2.75 | 0.6 | 304 | 3.04 | 0.6 | 0.29** | -- | -- |
| | | CT | 136 | 2.70 | 0.6 | 94 | 3.06 | 0.7 | 0.37** | -- | -- |
| | | MI | 195 | 2.78 | 0.6 | 210 | 3.03 | 0.6 | 0.24** | -- | -- |
| | STEM Program Teachers | All Schools | 143 | 2.71 | 0.5 | 136 | 3.00 | 0.6 | 0.29** | -- | -- |
| | | CT | 57 | 2.66 | 0.5 | 39 | 3.01 | 0.7 | 0.34** | -- | -- |
| | | MI | 86 | 2.75 | 0.5 | 97 | 3.00 | 0.6 | 0.25** | -- | -- |
| | Program Administrators | All Schools | 42 | 2.80 | 0.6 | 43 | 3.18 | 0.7 | 0.38* | -- | -- |
| | | CT | 18 | 2.75 | 0.7 | 16 | 3.27 | 0.8 | 0.51† | -- | -- |
| | | MI | 24 | 2.84 | 0.6 | 27 | 3.13 | 0.7 | 0.29† | -- | -- |
| | Program vs. Comparison Administrators | Program | 12 | | | | | | | 3.23 | 0.37 |
| | | Comparison | 18 | | | | | | | 2.86 | |
| Staff Provision of Academic/ Social-Emotional Support | All Program Teachers | All Schools | 330 | 3.31 | 0.5 | 304 | 3.43 | 0.5 | 0.11** | -- | -- |
| | | CT | 136 | 3.24 | 0.6 | 94 | 3.46 | 0.5 | 0.21** | -- | -- |
| | | MI | 194 | 3.36 | 0.5 | 210 | 3.41 | 0.6 | 0.05 | -- | -- |
| | STEM Program Teachers | All Schools | 143 | 3.29 | 0.5 | 136 | 3.36 | 0.5 | 0.07 | -- | -- |
| | | CT | 57 | 3.27 | 0.6 | 39 | 3.38 | 0.6 | 0.11 | -- | -- |

| Scale | Respondent | Level of Analysis | First Survey (2015) | | | Fourth Survey (2018) | | | Change | Adj. Mean | Impact Estimate |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | n | Mean | SD | n | Mean | SD | | | |
| | | MI | 86 | 3.31 | 0.5 | 97 | 3.36 | 0.5 | 0.05 | -- | -- |
| | Program Administrators | All Schools | 42 | 3.07 | 0.6 | 43 | 3.45 | 0.5 | 0.38** | -- | -- |
| | | CT | 18 | 2.93 | 0.7 | 16 | 3.41 | 0.6 | 0.48† | -- | -- |
| | | MI | 24 | 3.17 | 0.5 | 27 | 3.47 | 0.5 | 0.31* | -- | -- |
| | Program vs. Comparison Administrators | Program | 12 | | | | | | | 3.60 | 0.60* |
| | | Comparison | 18 | | | | | | | 3.00 | |

Note. * p < .05; ** p < .01; † p < .10

The survey also included two questions about the percentage of students who received assistance with the college application process (Table IV-6). Between 2015 and 2018 there was an increase in the percentage of students who were aided in applying to college and for financial aid in Michigan and a smaller change in Connecticut. In 2018, more than 90% of students, on average, were provided with such assistance. SECEP schools did not significantly differ from comparison schools on the number of students provided with such assistance.

*Table IV-6. College Application Assistance*

| Administrator Item | Respondent | Level of Analysis | First Survey (2015) | | | Fourth Survey (2018) | | | Change | Adj. Mean | Impact Estimate |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | n | Mean | SD | n | Mean | SD | | | |
| By the end of 12th grade, what percentage of students are given assistance in applying to college (e.g., selecting a college, completing applications, etc.)? | Program Administrators | All Schools | 39 | 3.31 | 0.8 | 42 | 3.71 | 0.5 | 0.41** | | |
| | | CT | 16 | 3.31 | 0.8 | 16 | 3.56 | 0.5 | 0.25 | | |
| | | MI | 23 | 3.30 | 0.8 | 26 | 3.81 | 0.5 | 0.50** | | |
| | Program vs. Comparison Administrators | Program | 12 | | | | | | | 3.69 | 0.04 |
| | | Comparison | 18 | | | | | | | 3.65 | |
| By the end of 12th grade, what percentage of students are given assistance in applying for financial aid? | Program Administrators | All Schools | 39 | 3.21 | 0.8 | 42 | 3.69 | 0.7 | 0.49** | | |
| | | CT | 16 | 3.19 | 0.8 | 16 | 3.56 | 0.6 | 0.38 | | |
| | | MI | 23 | 3.22 | 0.9 | 26 | 3.77 | 0.8 | 0.55** | | |
| | Program vs. Comparison Administrators | Program | 12 | | | | | | | 3.85 | 0.25 |
| | | Comparison | 18 | | | | | | | 3.60 | |

Note. The response scale was "less than 25%" (1), "26-50%" (2), "51-90%" (3), and "91-100%" (4). * p < .05; ** p < .01; † p < .10

During the interviews, participants were asked to describe their school's efforts to expand student support because of SECEP. In both Bridgeport and Michigan, supports were provided by teachers, district/ISD staff, and the college partners, although it was not always clear that changes in supports were due to SECEP. Support ranged from adding staff (like a district liaison) to changing school schedules to include advisory times or seminar classes. The interview findings mirrored the survey in that, from the onset of the grant, both Bridgeport and Michigan were focused on providing students with supports to prepare and support them in college courses. Interview responses are summarized below.

## Bridgeport

Over the course of the grant, Bridgeport expanded the supports received by students, some of which were due to the grant and some due to other projects.

### *Academic Supports*

Both the district and the community college had staff members dedicated to helping students bridge the gap between high school and college. As part of SECEP, the district assigned the college liaison role to personnel who provided supports and monitored students taking college course. The college liaison initially worked with a group of 100 students to prepare them for the college entrance test (Accuplacer). Students who passed this test could then begin taking college courses. In Year 2, the district college liaison continued to provide support for students enrolled in college courses. In the past, eligible students enrolled in college courses did not receive enough support and often dropped out of these courses. As a district staff member said, "…I think the college liaison has been the game-changer for us, that level of support."

During Year 1, the district also planned a new college readiness course for 9$^{th}$ graders that would focus on study, organizational, and social skills; they also scheduled college tours for high school students. The SECEP grant also supported math interventionists who worked with underprepared students in class or during pull-out times to get them on the grade level academically. The math interventionists also shared their instructional strategies and other tools with the classroom teachers.

Schools also initiated their own supports for students. For example, during Year 4, all staff that we interviewed at a middle school discussed using Scientific Research-Based Interventions in the afternoons, when students were organized into small groups based on academic need. At the high school level, respondents reported numerous academic supports, including the Reading Plus Program for English, STAR Renaissance Program, Khan Academy, and test preparation programs (e.g., SAT prep). A principal at one school and a teacher at another school mentioned using lab classes to help struggling students. Also, a teacher at one high school mentioned a new after-school tutoring program that was started during Year 3.

### *Socio-Emotional Support*

In terms of social and emotional support, middle school staff, high school staff, and district representatives reported that schools used Yale University's RULER Program (http://ei.yale.edu/ruler/how-ruler-works/) as well as a restorative justice program, both of which were not supported by SECEP but were seen as complements to the program.

### *College Knowledge*

One of the areas in which the grant appeared to influence student support was relative to the development of college knowledge. After SECEP began, the schools started offering activities designed to build students' college knowledge. For example, the partnership with the community college led to a high school coordinator going to high schools to help students complete their applications and attended high school meetings. Throughout the years, the college liaison helped students to use Naviance software to develop college readiness preparedness.

Both the district and schools implemented different initiatives to ensure students were knowledgeable about college. For example, during Year 2, the district held a college and career awareness week to increase college-going culture, and a college and career readiness day, when all high school students took the SAT or PSAT, and all 8th graders took the ReadiStep test. One of the high schools also developed a college skills curriculum that oriented students to the first year of college; this curriculum was put in place for all 9th graders.

Although staff at the middle and high schools, as well as district representatives, reported a number of efforts, some noted that formal supports were lacking and that this was due to limited resources at the schools. As one teacher said,

> I don't think that there's really a clear direction of promoting, like, having that academic support, having that social support, encouraging kids to go to college, helping them get to college, giving them the resources and skills that they need. I think that's something that needs a lot of improvement here.

In sum, the new supports provided by SECEP were the college liaison, the math interventionists, and the college readiness curriculum; other supports were either in place prior to the implementation of SECEP or were associated with programs not affiliated with SECEP (e.g., RULER, restorative justice).

## Michigan

Our interviews with school, district, and college partner staff suggest that academic and college knowledge supports for students varied within, and across districts/ISDs.

### *Academic Supports*

When SECEP began, the ISDs immediately started planning supports for students to be provided by schools or college partners. By the end of the project, five of the eight site visit schools had formally embedded, to some degree, academic and social supports into the school schedule. This was accomplished via seminar classes, advisory times, or freshman academies focused on topics ranging from academic support, soft-skills development, and/or college readiness

support. In two schools in one ISD, school leaders acknowledged the role SECEP played in the development of specific supports embedded in the curriculum. For example, in one 6-12 school, support time was embedded into a project-based learning class so that students could get academic support or help with homework. The other high school that we visited in the district offered a First Year Experience course to help less-prepared students develop the skills needed for future dual enrollment courses.

In some cases, ISDs and college partners collaborated to provide the necessary support. For example, one district, in partnership with the local Early College, provided a summer bridge program that focused on college readiness in reading and writing. Another district worked with their postsecondary partner, which has a required course for freshmen college students focusing on college readiness and study skills. The district schools integrated this course's elements into some of the required courses for high school freshmen, such as English.

In Year 3, two ISD coordinators described how their college partners had started to share information about dual enrolled students with the schools, especially struggling students. This information exchange allowed schools to intervene before these students failed their college classes. One of the coordinators indicated that this more proactive support by the college represented a shift in perspective,

> The college's directors are contacting the high school staff if a kid is struggling and then the high school staff is following up with that kid more quickly. It used to be, even with the dual-enrolled class on campus, they still viewed the kid as an adult, you know, this is up to you. We don't want them to fail.… Four or five years ago they [the college] wouldn't do that.

### *Affective Supports*

Supports in Michigan tended to focus on academic and college readiness. Other than support around soft skills (as described below), no interviewees described any emphasis on social-emotional supports.

### *College Knowledge*

Early in the project, project partners in Michigan asked participating ISDs and local districts to map the college knowledge necessary for students to enter and succeed in college. The districts thus had a strong focus on preparing students for college in their academic and soft skills, such as study skills. All districts worked to develop courses or curricula focused on college readiness as described under the STEM College Ready Academic Program.

One district developed an explicit college readiness curriculum. They also received a community grant to pilot a peer advisory model which used students with college experience as advisors to

peers under the guidance of counselors. The local high school encouraged and prepared students to take and pass the COMPASS assessment, do the online college application, and take college tours.

Although increased efforts to support students was evident, interviewees commented on the somewhat informal nature of the supports and expressed concerns that students were not utilizing offered supports. For example, in Year 4, in three schools across two ISDs, multiple respondents reported heavy reliance on informal academic and social supports provided by counselors and teachers. A teacher noted that this informality made it difficult to know "who's going to make the first move" in terms of identifying and supporting struggling students. Two staff members in one school attributed this lack of formal supports to staff turnover.

There was a concern across all four ISDs that while the community colleges offered a number of academic and social supports to students, dual enrolled students were either underutilizing these services or were unaware of their existence. As one college representative noted, dual enrolled students "are not fully aware of the supports that the community college has to offer, the tutoring labs and all of the different resources."

### Program-Wide Summary

In both Bridgeport and Michigan, students were provided academic, affective, and postsecondary support. While academic and postsecondary support appeared to be more formal, there seems to have been a less systematic approach for the affective support (except for the RULER program in Bridgeport). In both Bridgeport and Michigan there appeared to be an increase in supports from the postsecondary partnerships; it ranged from preparing students for college to supporting them while they took their dual enrollment courses. In both sites, these increased supports were provided by the district administrators and college partners. However, the interviews indicated that some of the increased supports were not a part of SECEP.

## High School-College Collaboration (Design Principle #3)

The third Design Principle, High School-College Collaboration, involves developing strong partnerships between the districts and postsecondary institutions. Evidence of these partnerships includes the signing of a formal MOU between the district and at least one postsecondary partner, establishing at least one career/college pathway in each school annually, sharing of resources, and ongoing communications between districts and colleges.

A theme that emerged across all data collected over the course of the evaluation was that districts and college partners strengthened their relationship over time and that, in many cases, SECEP helped facilitate new collaborations in addition to supporting preexisting relationships.

High School-College Collaborations were explored via two scales on the staff survey—one that measured number of times high school staff collaborated with college faculty (High School-College Collaboration Scale) and one that measured the supports provided by the college partner (Local College Support Scale). Results from staff surveys showed that, in general, there were positive changes between the first and final implementation of the staff survey, on both scales (see Table IV-7). Also, SECEP administrators reported higher levels of support from their local college than administrators at matched-comparison schools who were not part of SECEP.

*Table IV-7. High School-College Collaboration Scales*

| Scale | Respondent | Level of Analysis | First Survey (2015) | | | Fourth Survey (2018) | | | Change | Adj. Mean | Impact Estimate |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | n | Mean | SD | n | Mean | SD | | | |
| High School-College Collaboration | All Program Teachers | All Schools | 320 | 1.32 | 0.6 | 299 | 1.45 | 0.7 | 0.14** | | |
| | | CT | 134 | 1.33 | 0.6 | 91 | 1.52 | 0.8 | 0.19* | | |
| | | MI | 186 | 1.30 | 0.5 | 208 | 1.42 | 0.6 | 0.12* | | |
| | STEM Program Teachers | All Schools | 138 | 1.31 | 0.6 | 136 | 1.39 | 0.7 | 0.08 | | |
| | | CT | 57 | 1.29 | 0.7 | 39 | 1.53 | 0.9 | 0.23 | | |
| | | MI | 81 | 1.31 | 0.5 | 97 | 1.33 | 0.6 | 0.02 | | |
| | Program Administrators | All Schools | 40 | 2.10 | 0.8 | 43 | 2.54 | 0.8 | 0.44* | | |
| | | CT | 16 | 2.28 | 1.0 | 16 | 2.70 | 0.8 | 0.43 | | |
| | | MI | 24 | 1.99 | 0.8 | 27 | 2.44 | 0.8 | 0.45* | | |
| | Program vs. Comparison Administrators | Program | | | | | | | | N/A | N/A |
| | | Comparison | | | | | | | | N/A | |
| Local College Support | All Program Teachers | All Schools | 294 | 1.92 | 0.7 | 285 | 2.16 | 0.8 | 0.24** | | |
| | | CT | 123 | 1.91 | 0.7 | 83 | 2.14 | 0.8 | 0.23* | | |
| | | MI | 171 | 1.92 | 0.6 | 202 | 2.17 | 0.8 | 0.24** | | |
| | STEM Program Teachers | All Schools | 129 | 1.84 | 0.6 | 128 | 2.14 | 0.8 | 0.29** | | |
| | | CT | 52 | 1.83 | 0.7 | 36 | 2.18 | 0.8 | 0.34* | | |
| | | MI | 77 | 1.85 | 0.6 | 92 | 2.12 | 0.8 | 0.27* | | |
| | Program Administrators | All Schools | 40 | 2.12 | 0.7 | 42 | 2.54 | 0.7 | 0.42** | | |
| | | CT | 16 | 2.17 | 0.6 | 16 | 2.70 | 0.8 | 0.53* | | |
| | | MI | 24 | 2.08 | 0.8 | 26 | 2.44 | 0.6 | 0.36† | | |
| | Program vs. Comparison Administrators | Program | 12 | | | | | | | 2.57 | 0.72** |
| | | Comparison | 18 | | | | | | | 1.85 | |

Note. * p < .05; ** p < .01; † p < .10

The interviews supported these survey findings. Our initial interviews with district and school staff indicated that most districts collaborated with postsecondary partners prior to SECEP. However, a consistent finding from our interviews was that, over time, existing relationships were strengthened and new relationships formed as districts and college partners worked together to expand and improve dual enrollment and pathway opportunities. Additionally, several respondents in Bridgeport and across the Michigan ISDs, particularly the smaller ISDs, indicated that many of the new and strengthened relationships came about as a result of the district's involvement in SECEP. In the remainder of this section we provide a summary of what we learned from our interviews with representatives from Bridgeport and the Michigan districts.

### Bridgeport

In the first year of the project, Bridgeport had letters of agreement in place with a local community college, the local state university, and three local private universities. The three high schools were working to create four career pathways for students. Bridgeport also modified its master schedule for 9th- and 10th-grade students to better prepare students for community college courses. As noted earlier, Bridgeport also hired a district college liaison to help students take and pass college entrance exams to improve enrollments in college courses.

Over time, collaborations strengthened, and new ones were developed. For example, in the second year, there was a new collaboration with a local university that resulted in a program where 80 students at one high school were bussed to the university for an entire day, every other week, to take high school science and math classes on the college campus. In the third year, one of the high schools started a new partnership with a local hospital, which provided students at that school with an opportunity to take part in a health-related pathway.

By the time of our final interviews, district staff and college partners reported a number of activities where schools, districts, and college partners actively worked to improve the partnership and expand opportunities for students. For example, one college partner discussed a new initiative around hosting a district counselors' meeting to familiarize the counselors with the work of the college and to bring about greater awareness of opportunities for students. The college representative emphasized the importance of such activities by saying,

> It's important that the college knows the district and that the district knows the college, and not just president and superintendent, but down the line. And it's also important that not only each knows what the value of resources are in each respective entity but also what's going on. If we really want to exploit all that both has to offer, we have to have synergy of what's going on in terms of the different programs and activities.… So, I think that this programming allows for…use [of] that lens to bring those things into focus.

At both high schools and one of the middle schools visited in Year 4, respondents reported that college partners were engaged in a number of collaborations with school staff as part of, and in addition to, dual enrollment and providing access to high school-college career-themed pathways. In general, college partners have (1) provided information sessions to students and parents around college program availability, (2) hosted student field trips to the college, (3) worked with students and parents with the application process, and/or (4) facilitated information sessions around topics such as completing FAFSA applications.

All interviewees who mentioned college partnerships spoke of these partnerships as being positive and, in many cases, relationships were deepening or growing "exponentially." Although

many of the partnerships were in place prior to the grant, four respondents discussed how SECEP helped strengthen these relationships.

### Michigan

In Michigan, formal MoUs between districts and postsecondary partners were not developed until the second year, primarily because the MoUs had to address the challenging issue of how much each respective entity would pay for the costs of the college courses. Despite the lack of formal MoUs, schools in Michigan started creating pathways in collaboration with community college partners in areas such as engineering, construction technology, and various medical fields.

As with Bridgeport, stakeholders reported that relationships between the districts and postsecondary partners grew stronger over time. In the two smaller ISDs, each of which had only one community college partner, district representatives reported that these collaborations started as a result of SECEP. As one ISD coordinator put it, "The college was completely separate from the K-12 school systems and now we're working together, and we have a common goal, and we're collaborating much more." The two larger ISDs had a number of college partners in place prior to the grant, but the partnerships were strengthened as a result of the grant.

Although collaboration improved across all districts, the quality of collaborations varied across ISDs. For example, in one district, the college did not participate in regular project meetings. In another district, however, a respondent described very active participation,

> We have a designated college liaison. He is a science instructor over at the college. We also have a member of the college who is the Dean of Arts and Science and he has been participating in every SECEP meeting and he's been an integral part of bringing the college into the high school…. [with] their staff working with the high school staff and talking to them about aligning the curriculums in both high school and college.

The primary activity of the collaborations was expanding access to college courses, but colleges also provided support to districts in various ways. For example, in one ISD, the college partner helped the whole district science department to learn what it means to prepare their students for college-level courses. One coordinator described the role of the postsecondary partner,

> [Staff from the college] go to the local schools. They've done financial aid workshops for the general populations. They've been there for parent meetings and student assemblies when we want to talk about all these options. Kids in the 10th grade get bombarded with options in their junior and senior year.

One ISD did experience a setback with a college partner due to a leadership change at the college, combined with opposition from district and college unions. However, even in this district, the relationship improved such that the college was, for the first time, sending college instructors to the high school campus and reducing their fees to help the schools and districts meet budget constraints.

By the final year of the project, relationships had improved such that schools, districts, and college partners were working together to solve logistical issues around rising dual enrollments or creating new pathways. This led staff from both organizations to form closer working relationships and learn more about each other's organization. As one district leader said,

> I think now that we've been in this for four years, the colleges really understand, especially in a school like ours, all of the components that we have to deal with, and all of the challenges that our students bring to us. And there's a lot less blame game on their part, when the students go over there, because they get it now. And also, we understand the system that they work in, and who they have to report to with the board and their board's expectations. It's really more of a shared understanding and we're much...quicker to accommodate based on understanding what they need and what we need. It's a much nicer flow of information back and forth.

### Program-Wide Summary

In both Bridgeport and Michigan, it was evident that the grant had increased the number of postsecondary partners and strengthened ongoing partnerships. Across both states, there was a clear expectation that this would be one of the most sustainable parts of the grant. A staff member in Michigan said, "It is going to be a great partnership because we're so intertwined."

## Culture of Continuous Improvement (Design Principle #4)

The final Design Principle involved the creation of a Culture of Continuous Improvement through regular reflection around and use of high school and college performance data, ongoing teacher collaboration and professional development, and alignment of high school curriculum with college expectations. The quantitative data showed that school staff increased their use of data, particularly relative to students' performance in college classes; however, the difference between the treatment and comparison schools was not statistically significant.

Table IV-8 shows the percentage of staff who reported engaging in various targeted continuous improvement activities at least once per month on the survey.

*Table IV-8. Continuous Improvement Activities*

| Item | Respondent | Level | First Survey (2015) | | | Fourth Survey (2018) | | | Change | | Adj. Mean | Imp. Est. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | n | Once a Month + (%) | Mean | n | Once a Month + (%) | Mean | Once a Month + (%) | Mean | | |
| Our school collected or received data on student performance in college classes. | All Program Teachers | All Schools | 290 | 9.0 | 1.59 | 271 | 24.7 | 1.98 | 15.7 | 0.39** | | |
| | | CT | 118 | 5.1 | 1.39 | 75 | 20.0 | 1.73 | 14.9 | 0.34** | | |
| | | MI | 172 | 11.7 | 1.72 | 196 | 26.5 | 2.07 | 14.8 | 0.35* | | |
| | STEM Program Teachers | All Schools | 127 | 7.9 | 1.57 | 122 | 27.9 | 2.02 | 20.0 | 0.46** | | |
| | | CT | 52 | 1.9 | 1.31 | 32 | 15.6 | 1.56 | 13.7 | 0.25 | | |
| | | MI | 75 | 12.0 | 1.75 | 90 | 32.2 | 2.19 | 20.2 | 0.44** | | |
| | Program Admin. | All Schools | 40 | 15.0 | 1.98 | 42 | 38.1 | 2.40 | 23.1 | 0.43** | | |
| | | CT | 16 | 18.8 | 1.88 | 16 | 37.5 | 2.31 | 18.7 | 0.44 | | |
| | | MI | 24 | 12.5 | 2.04 | 26 | 38.5 | 2.46 | 26.0 | 0.42* | | |
| | Program vs. Comparison Admin. | Program | | | | | | | | | N/A | N/A |
| | | Comparison | | | | | | | | | N/A | |
| Staff used data on student performance in high school classes to improve curriculum and instruction. | All Program Teachers | All Schools | 315 | 48.6 | 2.53 | 292 | 57.9 | 2.71 | 9.3 | 0.18* | | |
| | | CT | 131 | 50.4 | 2.56 | 87 | 62.1 | 2.91 | 11.7 | 0.35** | | |
| | | MI | 184 | 47.3 | 2.51 | 205 | 56.1 | 2.62 | 8.8 | 0.11 | | |
| | STEM Program Teachers | All Schools | 136 | 52.2 | 2.57 | 135 | 55.6 | 2.67 | 3.4 | 0.11 | | |
| | | CT | 55 | 45.5 | 2.44 | 39 | 43.6 | 2.59 | -1.9 | 0.15 | | |
| | | MI | 81 | 56.8 | 2.65 | 96 | 60.4 | 2.71 | 3.6 | 0.05 | | |
| | Program Admin. | All Schools | 40 | 35.5 | 2.23 | 42 | 59.5 | 2.83 | 24.0 | 0.61** | | |
| | | CT | 16 | 37.5 | 2.19 | 16 | 81.3 | 3.19 | 43.8 | 1.00** | | |
| | | MI | 24 | 33.3 | 2.25 | 26 | 46.2 | 2.62 | 12.9 | 0.37 | | |
| | Program vs. Comparison Admin. | Prog. | 12 | | | | | | | | 3.02 | 0.20 |
| | | Comp. | 18 | | | | | | | | 2.82 | |
| I am provided scheduled time to work with other teachers on planning. | All Program Teachers | All Schools | 315 | 47.7 | 2.59 | 292 | 49.3 | 2.60 | 1.6 | 0.01 | | |
| | | CT | 131 | 64.8 | 3.00 | 86 | 70.9 | 3.17 | 6.1 | 0.17 | | |
| | | MI | 184 | 35.3 | 2.30 | 206 | 40.3 | 2.36 | 5.0 | 0.07 | | |
| | STEM Program Teachers | All Schools | 136 | 53.0 | 2.73 | 134 | 46.3 | 2.54 | -6.7 | -0.19 | | |
| | | CT | 55 | 69.1 | 3.16 | 38 | 65.8 | 3.05 | -3.3 | -0.11 | | |
| | | MI | 81 | 42.0 | 2.43 | 96 | 38.5 | 2.33 | -3.5 | -0.10 | | |
| | Program Admin. | All Schools | 40 | 52.5 | 2.70 | 42 | 66.7 | 3.05 | 14.2 | 0.35 | | |
| | | CT | 16 | 56.3 | 2.88 | 16 | 87.5 | 3.50 | 31.2 | 0.63 | | |
| | | MI | 24 | 50.0 | 2.58 | 26 | 53.8 | 2.77 | 3.8 | 0.19 | | |
| | Program vs. Comparison Admin. | Prog. | 12 | | | | | | | | 3.24 | 0.46 |
| | | Comp. | 18 | | | | | | | | 2.78 | |

Note. * p < .05; ** p < .01; † p < .10. Response options ranged from "never" (1) to "once or twice a week" (4).

For all teachers and administrators, results showed positive changes between 2015 and 2018 in schools' collection/receipt of data on student performance in college classes. Twenty five percent (25%) of teachers and 38% of administrators reported collecting or receiving these data at least once a month in 2018. There were also positive changes over time in administrators' and Bridgeport teachers' reports on staff use of high school student performance data to improve curriculum and instruction. This positive change was not apparent among the STEM and Michigan teachers surveyed, possibly due to initial relatively high values on this scale. Fifty-eight percent (58%) of teachers and 60% of administrators reported using high school performance data to improve curriculum and instruction at least once a month in 2018.

Further, there were positive changes (though not statistically significant) over time in administrators' reports on the extent to which they were provided scheduled time to work with teachers on planning. For teachers, changes were either negative or not apparent. Overall, 49% of teachers and 67% of administrators reported that they/staff were provided scheduled time to work with other teachers on planning at least once a month in 2018. SECEP administrators reported more frequent (though not statistically significant) use of data and more time to work with teachers on planning than did comparison administrators.

Data from the interviews and site visits also showed that there was an increase in data usage across the two states. Unlike the surveys, however, the individuals interviewed reported increases in collaboration between teachers. As described in the Implementation Supports section, NCREST provided support around data usage. A discussion of how schools used that data occurs first and then the results are discussed separately by state.

### School Use of NCREST Data

Throughout the grant, NCREST modeled data usage to administrators in both states. They shared school-level results from the student survey data they collected and results from the teacher survey collected as part of the evaluation. NCREST staff conducted workshops in how to interpret and use the data to make decisions.

By Year 3 of implementation, all four Michigan ISD coordinators commented that they used NCREST student survey data and the teachers really appreciated it. For example, two leaders noted that they were concerned the surveys showed a loss in students' interest in mathematics between Grades 8 and 12 and were trying to figure out how to address that concern. As one of them said,

> The [school staff] love the survey, and they feel like they're getting some answers to their questions. I know at one PD, they said that for the next few months, they were going to focus on one particular area, on the data that was collected, to find out about student disposition in math class, and what they could do to increase student, or improve student disposition, and finding where it's dropping off.

By the end of the project, one district representative reported how the student survey results prompted them to begin collecting additional data not previously collected by the district to inform decisions around dual enrollment.

### Bridgeport

***Using Data.*** In the early stages of implementation, district staff indicated a need to improve use of data from benchmark and interim assessments. By Year 2, Bridgeport had a district data team led by the district director of secondary education, who was also leading the SECEP project, and, according to district staff, an excellent data management department,

which provided data and reports for the team. The team met monthly and included guidance counselors and administrators from each high school and the SECEP project coordinator. The team looked at (1) testing data, such as SAT, PSAT, district standardized tests and classroom grades; (2) how many students were enrolled in AP and dual enrollment courses; (3) which courses they took; and (4) who were their teachers. This approach was continued in Year 3.

Data were also utilized by the JFF leadership coach. A district leader noted that the leadership coach always based her discussion with principals on data, and curriculum coordinators also discussed data as a basis for instructional decisions at all their faculty meetings,

> The environment in the classroom, the environment in the hallway, everything is boiled down to data. And especially when they get their data back from the state. [The coach] has them scrub that data.

While eight of 15 respondents stated that their school or district focused more on data in the past two to three years, most were not able to attribute the increase in quality and quantity of data use specifically to SECEP. Seven respondents reported that data had been a focus of the schools for several years. Nevertheless, some district and school staff highlighted differences that had occurred because of the project. One interviewed leader discussed how, as a result of the project, the district is drilling down more into specific data questions such as the relationship between taking certain dual enrollment classes and attendance or how students in certain classes or with certain teachers are performing academically.

A principal at one high school stated how the school had been "stuck" prior to the grant in terms of leveraging data to make changes. This principal went on to say that the school is collecting and examining more data than in previous years, but more importantly, data are being explored at multiple levels (e.g., grade, department, different student groups) and that this deeper dive into the data has led to improvements in the way the staff identify areas for improvement.

***Collaboration and Common Planning.*** In terms of internal professional development and collaboration efforts, representatives from the middle and high schools that we visited during Year 4 indicated that collaborations have increased in recent years through weekly and monthly common planning times for teachers (which regularly involved data discussions). The interviews with school and district representatives indicated that, although all teachers had regular opportunities to collaborate through common planning time or other regularly scheduled meetings, the middle schools appeared to have more organized and structured activities around data monitoring, including data teams devoted to vertical (within grade and/or department) as well as horizontal data alignment (across grade). A high school principal reported how teacher collaboration was key to sustaining the work by saying,

> I don't want success to be a hit one day and that we're at the point of slipping off again. I want it to have sustainability, whatever we do. Through common planning, we have the opportunity to do work through CIF, with the faculty, in which they work together using best practices, current research, and student data to make decisions on where the school is going to go.

The principals at both high schools reported that teachers had taken more of a leadership role in organizing and facilitating collaborative efforts.

### Michigan

***Using Data.*** In Michigan, data-use was a focus across all four years and each ISD was involved in data discussions. ISDs used a variety of other data to determine the readiness of their students for college courses. For example, at one district, a team looked at COMPASS data, algebra course pass rates, and credit audits. These data helped them to determine the state of students' academic skills and prompted conversations about addressing the gaps through, for example, summer bridge programs. In another district, their use of data around students' college performance revealed that students were lacking what they called "soft college readiness skills" and the district sought to develop strategies to address that concern.

Although data-driven decision-making was a priority among all districts, most respondents that we interviewed did not attribute the focus on data to any particular program, including SECEP. Various initiatives contributed to the more intensive use of data, such as Michigan's recent teacher evaluation system, the implementation of benchmark assessments across all four ISDs, and student tracking systems being implemented in three ISDs. However, four respondents that we interviewed did attribute the greater focus on data to SECEP. For example, one principal said that SECEP complemented the district's efforts around data and that exposure to SECEP activities gave district leaders ideas about how to use data more effectively.

***Collaboration and Common Planning.*** Most respondents that we interviewed across the four ISDs reported that teachers were collaborating more regularly, with a specific focus on data. In three of the four ISDs, our Year 4 interviews suggest that teachers were given some form of individual or common planning time or professional learning community time to collaborate. Six respondents reported that collaboration had increased out of necessity given all the changes that staff were asked to implement, as one teacher put it,

> Increased collaboration, we've talked about that. This is something that has to happen with what we're doing. In order to make sure that our curriculum is college-aligned or students are successful in classes, there's even scheduling is a big issue with a middle college, just making sure that our schedule matches up. Because of those things, we've had to increase our collaboration.

Three respondents also indicated that, as part of this process, teachers were taking more of a leadership role in facilitating these collaborations. As one coach said,

> We have a lot of teacher-led professional development or teacher-led staff meetings or teacher-led training because certain teachers have taken on leadership roles in SECEP and are experts in certain areas. So, I think then, that has caused communication between administration and teachers to improve because you have more teachers that are taking on leadership positions.

***Program-Wide Summary***

Three themes emerged in both Bridgeport and Michigan with regard to the Culture of Continuous Improvement Design Principle: (1) both states reported using multiple data sources, including standardized assessments, college placement assessments, dual enrollment data, grades, and attendance and discipline records; three ISDs also reported using student surveys provided by NCREST; (2) while all schools were using data to some extent before SECEP, during the project, schools and districts increased their focus on data, analyzing it at a deeper level and more systematically; and (3) contrary to survey results, many interviewees reported that teacher collaboration had increased and teachers had taken on more leadership roles.

## Summary of SECEP Impacts on Design Principles

As described in the previous sections, SECEP has changed the way in which schools were operating. The most substantial changes appeared to be in areas related to college-going, college readiness, college coursetaking, supports related to college readiness, and data usage. In the final administration of the staff survey, we asked respondents to consider whether changes in the school could be attributed specifically to SECEP. The survey asked nine questions about different potential impacts with response options ranging from "strongly disagree" (1) to "strongly agree" (4). It should be noted that these questions were considered cumulative, so we do not present any time comparison. As Table IV-9 shows, a majority of all respondents "agreed" or "strongly agreed" with all of the impact statements on the survey.

*Table IV-9. Perceptions of Implementation of the Early College Design Elements*

| Item | Respondent | Level | Fourth Survey (2018) | | |
|---|---|---|---|---|---|
| | | | n | Agree + Strongly Agree (%) | Mean |
| Because of SECEP, our school is better able to prepare students for college. | All Program Teachers | All Schools | 280 | 81.1 | 2.96 |
| | | CT | 83 | 81.9 | 2.93 |
| | | MI | 197 | 80.7 | 2.97 |
| | STEM Program Teachers | All Schools | 126 | 82.5 | 2.97 |
| | | CT | 35 | 77.1 | 2.77 |
| | | MI | 91 | 84.6 | 3.04 |
| | Program Admin. | All Schools | 42 | 88.1 | 3.12 |
| | | CT | 16 | 87.5 | 3.19 |
| | | MI | 26 | 88.5 | 3.08 |

| Item | Respondent | Level | Fourth Survey (2018) | | |
|---|---|---|---|---|---|
| | | | n | Agree + Strongly Agree (%) | Mean |
| Because of SECEP, our school has developed a culture of college awareness and readiness. | All Program Teachers | All Schools | 281 | 80.4 | 2.96 |
| | | CT | 82 | 80.5 | 2.91 |
| | | MI | 199 | 80.4 | 2.97 |
| | STEM Program Teachers | All Schools | 127 | 80.3 | 2.96 |
| | | CT | 35 | 77.1 | 2.77 |
| | | MI | 92 | 81.5 | 3.03 |
| | Program Admin. | All Schools | 42 | 90.5 | 3.14 |
| | | CT | 16 | 93.8 | 3.31 |
| | | MI | 26 | 88.5 | 3.04 |
| Because of SECEP, we have improved the instruction in our school. | All Program Teachers | All Schools | 279 | 75.6 | 2.90 |
| | | CT | 81 | 74.1 | 2.85 |
| | | MI | 198 | 76.3 | 2.91 |
| | STEM Program Teachers | All Schools | 125 | 77.6 | 2.90 |
| | | CT | 33 | 66.7 | 2.67 |
| | | MI | 92 | 81.5 | 2.99 |
| | Program Admin. | All Schools | 42 | 88.1 | 3.17 |
| | | CT | 16 | 81.3 | 3.13 |
| | | MI | 26 | 92.3 | 3.19 |
| Because of SECEP, I have improved my own instruction. | All Program Teachers | All Schools | 274 | 67.5 | 2.77 |
| | | CT | 79 | 72.2 | 2.78 |
| | | MI | 195 | 65.6 | 2.77 |
| | STEM Program Teachers | All Schools | 127 | 70.9 | 2.85 |
| | | CT | 35 | 68.6 | 2.69 |
| | | MI | 92 | 71.7 | 2.91 |
| | Program Admin. | All Schools | N/A | N/A | N/A |
| | | CT | N/A | N/A | N/A |
| | | MI | N/A | N/A | N/A |
| Because of SECEP, we implement more STEM projects. | All Program Teachers | All Schools | 277 | 74.7 | 2.89 |
| | | CT | 81 | 66.7 | 2.67 |
| | | MI | 196 | 78.1 | 2.98 |
| | STEM Program Teachers | All Schools | 126 | 75.4 | 2.97 |
| | | CT | 35 | 62.9 | 2.60 |
| | | MI | 91 | 80.2 | 3.11 |
| | Program Admin. | All Schools | 41 | 97.6 | 3.37 |
| | | CT | 16 | 93.8 | 3.31 |
| | | MI | 25 | 100.0 | 3.40 |
| Because of SECEP, our school has increased focus on STEM subjects and careers. | All Program Teachers | All Schools | 281 | 77.9 | 2.94 |
| | | CT | 82 | 68.3 | 2.77 |
| | | MI | 199 | 81.9 | 3.01 |
| | STEM Program Teachers | All Schools | 127 | 78.0 | 2.98 |
| | | CT | 35 | 65.7 | 2.71 |
| | | MI | 92 | 82.6 | 3.08 |
| | Program Admin. | All Schools | 41 | 92.7 | 3.27 |
| | | CT | 16 | 93.8 | 3.31 |
| | | MI | 25 | 92.0 | 3.24 |
| Because of SECEP, we have improved the supports that are in place for our students. | All Program Teachers | All Schools | 276 | 75.0 | 2.87 |
| | | CT | 82 | 76.8 | 2.83 |
| | | MI | 194 | 74.2 | 2.88 |
| | STEM Program Teachers | All Schools | 126 | 71.4 | 2.84 |
| | | CT | 35 | 68.6 | 2.69 |
| | | MI | 91 | 72.5 | 2.90 |
| | Program Admin. | All Schools | 42 | 85.7 | 3.07 |
| | | CT | 16 | 93.8 | 3.25 |
| | | MI | 26 | 80.8 | 2.96 |
| Because of SECEP, we have a stronger partnership with a postsecondary institution. | All Program Teachers | All Schools | 279 | 73.8 | 2.87 |
| | | CT | 82 | 67.1 | 2.70 |
| | | MI | 197 | 76.6 | 2.94 |
| | STEM Program Teachers | All Schools | 127 | 75.6 | 2.91 |
| | | CT | 35 | 65.7 | 2.63 |

| Item | Respondent | Level | Fourth Survey (2018) | | |
|---|---|---|---|---|---|
| | | | n | Agree + Strongly Agree (%) | Mean |
| | | MI | 92 | 79.3 | 3.01 |
| | Program Admin. | All Schools | 42 | 85.7 | 3.07 |
| | | CT | 16 | 75.0 | 3.00 |
| | | MI | 26 | 92.3 | 3.12 |
| Because of SECEP, we better use student performance data to improve instruction and student outcomes. | All Program Teachers | All Schools | 277 | 69.7 | 2.79 |
| | | CT | 82 | 72.0 | 2.77 |
| | | MI | 195 | 68.7 | 2.79 |
| | STEM Program Teachers | All Schools | 126 | 65.9 | 2.74 |
| | | CT | 35 | 62.9 | 2.60 |
| | | MI | 91 | 67.0 | 2.79 |
| | Program Admin. | All Schools | 42 | 83.3 | 3.00 |
| | | CT | 16 | 87.5 | 3.13 |
| | | MI | 26 | 80.8 | 2.92 |

Note. Response options ranged from "strongly disagree" (1) to "strongly agree" (4). It should be noted that these questions are considered cumulative, so we do not present any time comparison

The highest proportion (over 80%) of teachers and administrators agreed that the project had resulted in an increased focus on college readiness. Administrators "agreed" or "strongly agreed" with the following impacts of the SECEP project:

- We implement more STEM projects (97.6%),
- Our school has increased focus on STEM subjects and careers (92.7%), and
- Our school has developed a culture of college awareness and readiness (90.5%).

Teachers most strongly agreed with the following impacts of the SECEP project:

- Our school is better able to prepare students for college (81.1%),
- Our school has developed a culture of college awareness and readiness (80.4%),
- Our school has increased focus on STEM subjects and careers (77.9%), and
- We have improved the instruction in our school (75.6%).

The next sections of the report examine whether the school-level changes resulted in positive impacts for the students.

## SECTION V: STUDENT IMPACTS—MICHIGAN

The implementation supports and Design Principles described previously were intended to lead to improvement on a set of core outcomes, including an increased percentage of students earning college credit and reduced dropout rates. In this section, we present results from the quasi-experimental analyses of the impact of SECEP in Michigan. We also summarize perceived impacts on students and staff.

Key findings concerning the impact of the project include the following.

- There was an eight percentage-point impact on the percentage of students enrolled in college-level courses, a difference that was not statistically significant.
- There was a statistically significant 12 percentage-point impact on the percentage of students who received at least one college credit.
- Treatment students earned approximately twice as many college credits as comparison students, a difference that was statistically significant.
- There were positive impacts on college coursetaking and credits earned for economically disadvantaged students.
- There was a positive impact relative to college coursetaking and credits earned for non-minority students and no significant impact on underrepresented minority students. This has led to a widening gap between the two populations. Additionally, minority students participated in college courses at a rate less than one-third that of non-minority students.
- Impacts related to college coursetaking increased each year as the program became more mature, with Year 4 impacts higher than Year 3 impacts which were higher than Year 2 impacts.
- There was no statistically significant impact on dropout rates.
- A majority of school staff "agreed" or "strongly agreed" that SECEP had resulted in a range of positive effects on their school culture and students.
- In interviews, the most frequently mentioned project impacts were related to an increased orientation toward post-high school plans for students, expanded access to dual enrollment courses, and increased collaboration among teachers.

### Methodology

The evaluation used a quasi-experimental design to assess the impact of the project on outcomes in two domains: (1) college credit-bearing courses and (2) dropping out of school.

## Sample

The study sample in Michigan included 11 treatment high schools[3] and 42 comparison schools that were similar to the 11 treatment schools on baseline measures of the outcomes and key demographic characteristics. We began by identifying a potential pool of comparison schools. Characteristics of the treatment schools were used to establish inclusion criteria for potential control schools. Because all treatment schools were classified as general education schools, specialized schools were excluded (e.g., alternative, special education, vocational/CTE, magnet, IB, and charter schools). In addition, because some treatment schools were combined middle and high schools, the list of potential comparison schools also included schools that served middle and high school students. In our original matching we identified 44 comparison schools (four schools for each treatment school). However, after conducting the matching, we learned that one of the comparison schools had an Early College operating within the school, and one school closed during the study period. Both schools were excluded from the study.

We employed a matching procedure entitled "nearest neighbor match" with Mahalanobis distance criteria, using the R software program MatchIT version 3.02 (Ho et al., 2011). The outcome measures and characteristics on which the schools were matched included the following indicators all measured in the baseline year (2013-14):

- **School type.** Because several schools in the treatment group were combined middle school and high school, we ensured that schools were matched within type (i.e., high school only, middle and high school). This information was available at the school level.
- **Percentage of students dropping out of school.** We used the four-year cohort dropout rate calculated at the school level by the Michigan Department of Education.
- **Percentage of students receiving some college credit.** This was the percentage of 11$^{th}$ and 12$^{th}$ graders who had taken and received college credit in the 2013-14 school year through one or more potentially college credit-bearing courses, including AP and dual-enrollment courses. This variable was calculated from student-level data provided by the Michigan Department of Education and rolled up to the school level.
- **Average number of college credits earned.** This measure looked at the average number of college credits earned by 11$^{th}$- and 12$^{th}$-grade students in the 2013-14 school year either by passing the AP exam or by passing college credit classes (see outcomes section

[3] At the end of 2017, one of the treatment schools closed. The majority of students who attended this school enrolled in two treatment schools within the same district in 2018. For purpose of assigning baseline school-level covariates, students who transferred out of the closed treatment school at the end of 2017 were assigned the baseline school-level covariates for the school they were enrolled in in 2018. The final outcome analysis included 11 treatment schools in 2017 and 10 treatment schools in 2018.

below for a more detailed description on this variable). Similar to the previous variable, this variable was calculated from student-level data provided by the Michigan Department of Education and rolled up to the school level.

- **Percentage of students who were identified as economically disadvantaged.** These data were available at the school level.
- **Percentage of students who identified as African-American, American Indian, or Hispanic/Latino.** These data were available at the school level.[4]
- **School enrollment.** This was the number of students enrolled in the entire school. For schools that contained both middle and high school students, the school size variable reflected enrollment for both grade configurations.
- **National standardized test score.** This was the average ACT composite score (math, reading, English, and science) for students in the school, converted to z-scores.
- **State proficiency.** This was the average scale score on the math and reading portions of the Michigan Merit exam, also converted to z-scores.

In order for the treatment and comparison samples to be considered equivalent by the What Works Clearinghouse (WWC) standards, the differences between the two groups must be less than .25 standard deviations. We assessed baseline equivalence on baseline measures of the outcomes and on key demographic characteristics. As Table V-1 shows, the difference between the two groups was less than .25 standard deviations on all outcome measures and demographic characteristics. It is important to note that we took the most conservative approach to assessing baseline equivalence, calculating the differences at the school level. No data used to calculate baseline equivalence were imputed at either the school or student level.

*Table V-1. Baseline Equivalence, Treatment and Comparison Groups, Michigan*

| Measure | Treatment Mean (SD) N=11 | Comparison Mean (SD) N=42 | Standard Deviation (Pooled) | Effect Size (Hedge's *g*) |
|---|---|---|---|---|
| Cohort dropout rate | 3.657 (2.074) | 4.032 (3.144) | 2.965 | .124 |
| % of 11th- and 12th-grade students receiving at least one college credit | 6.958 (9.991) | 6.268 (8.013) | 8.437 | .081 |
| Average college credits earned | .518 (.783) | .453 (.799) | .796 | .081 |
| % Economically disadvantaged | 47.013 (14.830) | 47.044 (18.052) | 17.467 | .002 |
| % Minority | 28.852 (31.890) | 24.911 (31.795) | 31.813 | .153 |
| School enrollment | 622.091 (367.403) | 637.929 (438.333) | 425.359 | .037 |

[4] For schools that were combined middle and high schools, we calculated the percentage of economically disadvantaged and racial minority students in the high school from the student-level data.

| Measure | Treatment Mean (SD) N=11 | Comparison Mean (SD) N=42 | Standard Deviation (Pooled) | Effect Size (Hedge's *g*) |
|---|---|---|---|---|
| ACT (z-score) | 18.482 (1.910) | 18.629 (1.717) | 1.756 | .082 |
| Michigan Merit Exam Scores for Reading and Math (z-score) | 1098.333 (11.133) | 1099.740 (10.419) | 10.563 | .131 |

We also calculated baseline equivalence for the two sub-groups of interest: (1) economically disadvantaged students and (2) students who were members of racial or ethnic groups underrepresented in college (American Indian, African-American, and Hispanic/Latino). Baseline equivalence for the sub-groups is provided in Appendix D.

A note about sample representativeness: No students were dropped from the baseline equivalence calculations because of missing data; as a result, 100% of enrolled students were included in both the dropout and the college coursetaking outcomes. The outcome analytic samples included only students who had complete baseline covariates (achievement data and demographic characteristics). As such, not all students were included in the sample. For the dropout sample, 85.1% of the enrolled treatment group students in the relevant grades contributed data to the outcome analysis, and 86.3% of enrolled comparison group students in the relevant grades contributed data to the outcome analysis. For the college course taking analyses, 85.1% of the enrolled treatment group students in the relevant grades contributed data to the outcome analysis, and 85.7% of enrolled comparison group students in the relevant grades contributed data to the outcome analysis.

### Outcomes

All outcomes used student-level data provided by the Michigan Department of Education. Thus, the first two outcomes were binary and the third was interval at the student level and discussed below as percentages and averages, respectively. It is important to note that no outcome measures were imputed.

- **Percentage of students enrolled in at least one college credit-bearing course.** This measure examined the percentage of 11$^{th}$- and 12$^{th}$-grade students in the school who enrolled in at least one college bearing course at any point in their high school career, identified in the data as either dual enrollment or AP. These results were examined for the 2015-16, 2016-17, and 2017-18 years.
- **Percentage of students who received at least one college credit.** This measure examined the percentage of 11$^{th}$- and 12$^{th}$-grade students in the school who enrolled in at least one college-level course and received college credit for that course at any point in their high school experience. Students could have received credit either through

enrolling in at least one AP course and passing the AP exam or enrolling in at least one dual enrollment course in any year of high school and passing the course. These results were examined for the 2015-16, 2016-17, and 2017-18 years.

- **Number of potential college credits received.** This outcome was the average number of potential college credits received by 11th- and 12th-grade students. We use the term potential college credit because only postsecondary institutions can actually award the credit. Potential college credits could be earned in two ways. First, we obtained scores for students who took AP exams. Students were awarded potential college credit using AP transfer equivalencies from the University of Michigan-Flint campus. The second way for a student to earn potential college credit was through receiving credit for a dual enrollment course. For students who passed a dual enrollment course (i.e., indicated as a "pass" in the transcript data), in order to obtain an estimate of the total number of credits earned, we multiplied the number of classes completed by three credits. This outcome was cumulative and included credits that students in the sample had earned in previous years and in the current year. These results were examined for the 2015-16, 2016-17, and 2017-18 years.
- **Dropping out of school.** This outcome was the proportion of students in the high school, Grades 9-12, who were identified as dropping out in the 2016-17 and 2017-18 school years.

### Analysis

The difference between SECEP and comparison schools was examined using hierarchical linear modeling (HLM) implemented with SPSS (version 25) Linear Mixed Model, which accounts for the fact that students are nested within schools (SPSS, 2005). In addition to including a binary indicator for treatment status, the models also included grade and study year as design factors and the following variables were included in the models as covariates:

- **Student level.** Middle school math and reading scores (standardized as z-scores), minority status, economically disadvantaged status, English Language Learner status, exceptionality status, and gender.
- **School level.** Baseline measure of the percent of students receiving at least one college credit, baseline percent minority, baseline percent economically disadvantaged, school enrollment, baseline school dropout rate, and baseline academic performance.

Because the three college course outcomes were cumulative and because we were pooling data in our sample across three years, this posed a special challenge for our analysis. It was possible for students to appear twice in the analytic data file (for example, students who enrolled in high school in 2014-15 could appear once as an 11th-grade student in 2016-17 and again as a 12th-grade student in in 2017-18). For these cases, the 12th-grade record was retained

for analysis because it would have captured accumulated college credit through 12th grade. If a student was present in 11th grade in 2016-17, but not present in 12th grade in 2017-18, the 11th-grade record was retained for analysis.

We repeated the above analyses for the two sub-groups of interest, economically disadvantaged students and minority students.

## Impact on Enrollment in College Credit-Bearing Courses

As described above, we explored two different outcomes related to enrollment in college credit-bearing courses: (1) enrollment in at least one college credit-bearing course and (2) receipt of at least one college credit. We first begin by looking at enrollment in the college courses.

As shown in Table V-2, there was an overall impact on college-level course enrollment of 7.7 percentage points. This difference was not statistically significant at the standard value of p≤.05. However, when looking at the impacts by type of college-level courses, we see a statistically significant impact of 13.0 percentage points on enrollment in dual enrollment, which is partially offset by a nine percentage-point drop in enrollment in AP courses.

*Table V-2. Impacts on the Percentage of 11th and 12th graders Enrolled in at least One College Credit-Bearing Course, Michigan*

| Outcome | Treatment | | Comparison | | Adjusted Impact Estimate at Year 4 | Impact Estimate Standard Error | p-value |
|---|---|---|---|---|---|---|---|
| | Sample | Adjusted Mean (SD) | Sample | Unadjusted Mean (SD) | | | |
| % 11th and 12th graders enrolled in any college course | 5,230 | 45.23 (49.44) | 20,863 | 37.50 (48.41) | 7.73 | 5.07 | .13 |
| % 11th and 12th graders enrolled in dual enrollment courses only | 5,230 | 20.48 (35.98) | 20,863 | 7.44 (26.25) | 13.03 | 4.42 | <.01 |
| % 11th and 12th graders enrolled in AP courses only | 5,230 | 16.98 (37.88) | 20,863 | 26.05 (43.89) | -9.06 | 5.64 | .12 |
| % 11th and 12th graders enrolled in both AP and dual enrollment courses | 5,230 | 7.89 (29.82) | 20,863 | 4.01 (19.62) | 3.88 | 1.97 | .06 |
| % enrolled in any college course--underrepresented minority students | 1,527 | 34.20 (43.40) | 6,694 | 33.58 (47.23) | .62 | 5.44 | .91 |
| % enrolled in any college course—NON-minority students | 3,703 | 45.95 (50.01) | 14,169 | 39.35 (48.86) | 6.59 | 4.99 | .19 |
| % enrolled in any college course—economically disadvantaged students | 2,462 | 35.51 (46.17) | 9,478 | 28.14 (44.97) | 7.37 | 5.23 | .17 |
| % enrolled in any college course—NON-economically disadvantaged students | 2,768 | 51.99 (49.92) | 11,385 | 45.30 (49.78) | 6.69 | 5.15 | .20 |
| % enrolled in any college course—11th-grade students | 3,866 | 35.45 (45.27) | 15,272 | 28.70 (45.24) | 6.75 | 4.29 | .12 |
| % enrolled in any college course—12th-grade students | 3,706 | 48.98 (49.90) | 14,815 | 41.88 (49.34) | 7.10 | 5.23 | .18 |

Results related to earning at least one college credit were also analyzed for specific sub-groups of students: (1) underrepresented minority students, (2) students who were not underrepresented minority (White or Asian), (3) students who were economically disadvantaged, and (4) those who were not economically disadvantaged. The results were also analyzed by grade. None of the sub-groups examined had statistically significant impacts. In particular, there was an impact of close to zero on the enrollment of minority students in any college credit-bearing courses. When we broke the minority enrollment out by AP and dual enrollment courses, we see that minority students are much more likely to be enrolled in AP courses than in dual enrollment courses; in fact, a higher percentage of minority students in SECEP schools were enrolled in AP (19.6%) than non-minority students (16.4%). The reverse was the case with dual enrollment, where 12.1% of SECEP minority students were enrolled only in dual enrollment course compared to 20.9% of SECEP non-minority students. These detailed sub-group analyses are provided in Appendix E.

The next outcome examined was the percentage of 11th-and 12th-grade students who had earned at least one college credit. As Table V-3 shows, there was a statistically significant 12 percentage-point impact on the percentage of students receiving at least one college credit.

*Table V-3. Impacts on the Percentage of 11th and 12th Graders Receiving at Least One Potential College Credit, Michigan*

| | Treatment | | Comparison | | Adjusted Impact Estimate at Year 4 | Impact Estimate Standard Error | p-value |
|---|---|---|---|---|---|---|---|
| Outcome | Sample | Adjusted Mean (SD) | Sample | Unadjusted Mean (SD) | | | |
| % 11th- and 12th-grade students who earned at least one college credit | 5,230 | 29.76 (44.16) | 20,863 | 17.48 (37.98) | 12.28 | 3.30 | <.001 |
| % 11th- and 12th-grade students who received credit only through dual enrollment | 5,230 | 22.86 (40.99) | 20,863 | 9.97 (29.95) | 12.90 | 3.87 | <.01 |
| % 11th- and 12th-grade students who received credit only through AP courses | 5,230 | 4.57 (16.25) | 20,863 | 6.60 (24.82) | -2.03 | 1.69 | .24 |
| % 11th- and 12th-grade students who received credit through both AP and E dual | 5,230 | 2.37 (15.51) | 20,863 | .92 (9.52) | 1.45 | .64 | .03 |
| % Underrepresented minority students who earned at least one college credit | 1527 | 14.68 (33.96) | 6694 | 8.90 (28.48) | 5.78 | 3.00 | .06 |
| % NON-minority students who earned at least one college credit | 3703 | 32.29 (46.65) | 14,169 | 21.53 (41.10) | 10.77 | 3.69 | .01 |
| % Economically disadvantaged students who earned at least one college credit | 2,462 | 20.69 (37.62) | 9,478 | 10.17 (30.23) | 10.52 | 2.95 | <.01 |
| % NON-Economically disadvantaged students who earned at least one college credit | 2,768 | 36.17 (47.70) | 11,385 | 23.56 (42.44) | 12.61 | 3.77 | <.01 |
| % Grade 11 students who earned at least one college credit | 3,866 | 21.04 (39.51) | 15,272 | 11.42 (31.81) | 9.62 | 3.07 | <.01 |
| % Grade 12 students who earned at least one college credit | 3,706 | 31.57 (44.76) | 14,815 | 20.26 (40.19) | 11.32 | 3.64 | <.01 |

Note. The adjusted treatment mean is calculated by taking the unadjusted comparison mean and adding the adjusted impact estimate.

Why was there a statistically significant impact on earning college credit but not on enrollment in college-level courses? As shown in the table, we see that, overall, more students received college credits through dual enrollment than through AP, despite an overall higher percentage of students enrolled in AP courses (see Table V-2). We conducted follow up descriptive analyses that showed that students were much more likely to earn college credit when they took dual enrollment courses than when they took AP courses. The percentage of dual enrollment courses that resulted in potential college credit was over 90%. On the other hand, the percentage of AP courses that resulted in potential college credit (earned by taking the exam and receiving a passing score) was less than 10% in our sample.

When looking at impacts by sub-group, we see a 6 percentage-point impact on minority students' completion of at least one college credit; a result that was statistically significant at *p=.06*. This was compared to a statistically significant impact of 10.8 percentage points on non-minority students. In looking within the treatment group only, 14.7% of minority students earned at least one college credit compared to 32.3% of non-minority students.

The impact on economically disadvantaged students was a statistically significant 10.5 percentage points compared to a significant 12.6 percentage-point impact on non-economically disadvantaged students. When examined by grade, the impact was larger for 12$^{th}$-grade students than for 11$^{th}$-grade students. More detail on the sub-group analyses can be found in Appendix E.

### Impact on College Credit Attainment

The third outcome related to college coursetaking was the number of potential college credits earned. This outcome incorporated any increase in access to college courses as shown under the previous outcome, coupled with any increase in the number of courses students were taking.

Table V-4 shows the total number of credits earned by 11$^{th}$ and 12$^{th}$ graders. As the results show, the number of credits earned by treatment students was approximately double the number of credits earned by comparison students (i.e., 3.5 credits for treatment students compared to 1.8 credits for comparison students). The table also shows that the majority of these credits were earned via dual enrollment courses, with treatment students earning approximately 2.5 times as many dual enrollments credits as comparison students. Regarding AP credits, treatment students earned slightly (although non-significantly) fewer credits from AP courses than comparison students did.

*Table V-4. Impacts on 11th- and 12th-Grade Students' Number of Potential College Credits Earned, Michigan*

| Outcome | Treatment | | Comparison | | Adjusted Impact Estimate at Year 4 | Impact Estimate Standard Error | p-value |
|---|---|---|---|---|---|---|---|
| | Sample | Adjusted Mean (SD) | Sample | Unadjusted Mean (SD) | | | |
| Average # of credits earned | 5,230 | 3.53 (8.10) | 20,863 | 1.75 (5.49) | 1.78 | .42 | <.001 |
| Average # of credits earned through dual enrollment | 5,230 | 2.94 (7.86) | 20,863 | 1.10 (4.43) | 1.84 | .48 | <.001 |
| Average # of credits earned through AP courses | 5,230 | .59 (1.60) | 20,863 | .65 (3.30) | -.06 | .19 | .76 |
| Average # of credits earned through both AP and dual enrollment | 5,230 | .41 (2.83) | 20,863 | .14 (1.74) | .27 | .08 | <.01 |
| Average # of credits earned by underrepresented minority students | 1,527 | 1.31 (4.41) | 6,694 | .78 (3.75) | .53 | .47 | .26 |
| Average # of credits earned by NON-minority students | 3,703 | 4.08 (9.09) | 14,169 | 2.21 (6.09) | 1.86 | .58 | <.01 |
| Average # of credits earned by economically disadvantaged students | 2,462 | 2.44 (6.17) | 9,478 | 0.95 (3.99) | 1.49 | .39 | <.001 |
| Average # of credits earned by NON-economically disadvantaged students | 2,768 | 4.61 (9.33) | 11,385 | 2.42 (6.40) | 2.18 | .72 | <.01 |
| Average # of credits earned by Grade 11 students | 3,866 | 1.77 (4.12) | 15,272 | .89 (3.26) | 0.88 | .29 | <.01 |
| Average # of credits earned by Grade 12 students | 3,706 | 4.43 (9.21) | 14,815 | 2.13 (6.16) | 2.03 | .69 | < .001 |

When examining the impact by sub-groups, we saw no significant impact on credits earned by underrepresented minority students and a significant, positive impact on credits earned for non-underrepresented minority students. In the treatment group, the number of credits earned by minority students was approximately one-third the amount earned by non-minority students; while in the comparison group, minority students earned slightly less than one half the number of credits as non-minority students. Both economically and non-economically disadvantaged students saw significant and positive impacts, with a larger impact seen by non-economically disadvantaged students. The impact on 12th graders was larger than the impact on 11th graders.

## Changes Over Time

The impacts reported above combine three cohorts of students, from the second, third, and fourth years of implementation. Because the STEM Early College Model is complex and requires the establishment of systems over time, we might expect to see impacts increase as the program becomes more mature. In other words, we might expect examples for students in the fourth year of implementation (2017-18) to be higher than impacts were for the first cohort we looked at (2015-16). As a result, we explored impacts by year. As Table V-5 shows, we do see larger impacts as the program matures. For example, the impact on enrollment in college

credit-bearing courses was only 3 percentage points in 2015-16 but it was 16.5 percentage points and statistically significant in 2017-18.

*Table V-5. Impact on College Credit-Bearing Courses, by Year of Implementation, Michigan*

| Outcome | Year | Treatment | | Comparison | | Impact Estimate | Impact Estimate Standard Error | P-value |
|---|---|---|---|---|---|---|---|---|
| | | Sample | Adjusted Mean (SD) | Sample | Unadjusted Mean (SD) | | | |
| % 11th and 12th graders enrolled in any college course | 2015-16 | 2,600 | 36.36 (45.82) | 10,243 | 33.37 (47.16) | 2.99 | 4.75 | 0.53 |
| | 2016-17 | 2,539 | 43.57 (48.82) | 10,198 | 35.37 (47.81) | 8.20 | 4.27 | 0.06 |
| | 2017-18 | 2,535 | 53.15 (49.76) | 9,968 | 36.62 (48.18) | 16.53 | 4.93 | <.01 |
| % 11th- and 12th-grade students who earned at least one college credit | 2015-16 | 2,600 | 20.91 (38.87) | 10,243 | 13.22 (33.87) | 7.70 | 3.44 | 0.03 |
| | 2016-17 | 2,539 | 25.59 (42.07) | 10,198 | 16.53 (37.15) | 9.06 | 3.23 | <.01 |
| | 2017-18 | 2,535 | 33.42 (46.16) | 9,968 | 17.48 (37.98) | 15.95 | 3.93 | <.001 |
| Average # of credits earned | 2015-16 | 2,600 | 2.02 (5.04) | 10,243 | 1.15 (4.18) | 0.87 | 0.32 | <.01 |
| | 2016-17 | 2,539 | 3.05 (8.03) | 10,198 | 1.57 (5.06) | 1.48 | 0.47 | <.01 |
| | 2017-18 | 2,535 | 4.38 (9.23) | 9,968 | 1.80 (5.59) | 2.58 | 0.55 | <.001 |

## Exploring Sub-Group Gaps

As described above, there were gaps in attainment between certain sub-groups. For example, in looking at the percentage of students who earned at least one college credit, we saw that 14.7% of underrepresented minority students in SECEP schools earned at least one college credit. This was more than the 8.9% of underrepresented minority students earning at least one college credit in comparison schools, but it was also substantially less than the percentage of non-minority students earning at least one college credit (32.3% in SECEP schools). Table V-6 below summarizes the sub-group findings.

When we looked at the size of the difference—the gap between the percentage of minority students in a school taking college-level courses and the percentage of non-minority students taking college-level courses—we saw that the gap in earning at least one college credit between minority and non-minority students was larger in SECEP schools than in comparison schools. For example, the gap between the percentage of minority and non-minority students earning at least one college credit in SECEP schools was approximately 18 percentage points in SECEP schools compared to 13 percentage points in comparison schools. On the other hand, when looking at gaps between economically disadvantaged and not economically disadvantaged students, they were essentially the same in both SECEP and comparison schools (15 percentage points in SECEP schools and 13 percentage points in comparison schools).

To explore the gaps in more depth, we tested whether there were also gaps in enrollment in the courses (gaps in access) and gaps in successful completion once a student was enrolled in the course. As Table V-6 shows, there was also a gap in enrollment between underrepresented minority and non-minority students and between economically disadvantaged and not economically disadvantaged students. This suggests that underrepresented minority and low-income students enrolled in lower numbers in college-level courses in both treatment and comparison settings, with a larger enrollment gap for minority students in SECEP schools than in comparison schools.

*Table V-6. Summary of Sub-Group Gaps*

| | Underrepresented Minority Status | | | | Economically Disadvantaged Status | | | |
|---|---|---|---|---|---|---|---|---|
| | SECEP | | Comparison | | SECEP | | Comparison | |
| Outcome | Minority | Not Minority | Minority | Not Minority | ED | Not ED | ED | Not ED |
| % of 11th and 12th graders enrolled in any college course | 34.2 | 46.0 | 33.6 | 39.4 | 35.5 | 52.0 | 28.1 | 45.3 |
| | Gap=11.8 | | Gap=5.8 | | Gap=16.5 | | Gap=17.2 | |
| % of 11th and 12th graders receiving at least one college credit | 14.7 | 32.3 | 8.9 | 21.5 | 20.7 | 36.2 | 10.2 | 23.6 |
| | Gap=17.6 | | Gap=12.6 | | Gap=15.5 | | Gap=13.4 | |
| % of students who earned at least one college credit when taking college-level courses | 43.0 | 70.2 | 26.5 | 54.6 | 58.3 | 69.6 | 36.3 | 52.1 |
| | Gap=27.2 | | Gap=28.1 | | Gap=11.3 | | Gap=15.8 | |

Note. The sample for the first two outcomes is the full population of the specific sub-group. The sample for the third outcome is only those students who took at least one college-level course.

When we looked at successful completion of courses once students are enrolled, we saw that gaps were present in that situation as well. The table shows that once a minority student was enrolled in a college-level course, the gap in successful completion rates between minority and non-minority students was larger than the gap in enrollment, but it was similar in both SECEP and comparison schools (27 percentage points in SECEP schools and 28 percentage points in comparison schools). It is also important to note that all students in SECEP schools were more likely to receive potential college credit for their classes than were similar students in comparison schools.

A possible mechanism for the increased success in SECEP college courses may be related to differences in AP and dual enrollment coursetaking. As described earlier, underrepresented minority students were more likely to take AP courses than dual enrollment courses, but AP courses were also less likely to result in potential college credit. Thus, part of the explanation appeared to be driven by the types of courses to which students were given access.

These findings suggest that the gaps between minority and non-minority students and between economically disadvantaged and not economically disadvantaged students are due to inequities in both access, particularly to dual enrollment courses, and in successful completion.

## Impact on Dropouts

As part of the Early College Model theory of change, students are expected to gain more of a vision of their future and provide students with additional supports. These components of the model are expected to work together to keep more students in school. As a result, the evaluation examined the impact on the percentage of students in Grades 9-12 who dropped out of high school in either the third or fourth years of implementation (2016-17 and 2017-18 school years). As Table V-7 shows, there were no statistically significant differences between treatment and comparison groups, although dropout rates were descriptively lower overall and for all sub-groups (with the exception of non-minority students) in the treatment schools.

*Table V-7. Impacts on Percentage of Students Dropping Out of School, Michigan*

| Outcome | Treatment | | Comparison | | Adjusted Impact Estimate at Year 4 | Impact Estimate Standard Error | p-value |
|---|---|---|---|---|---|---|---|
| | Sample | Adjusted Mean (SD) | Sample | Unadjusted Mean (SD) | | | |
| % of students who dropped out of school | 10,528 | 1.63 (11.33) | 41,092 | 1.84 (13.44) | -.21 | .46 | .66 |
| % Underrepresented minority students who dropped out of school | 3,015 | 2.41 (13.50) | 13,069 | 2.96 (16.94) | -.55 | .76 | .48 |
| % NON-minority students who dropped out of school | 7,513 | 1.53 (10.28) | 28,023 | 1.30 (11.35) | .22 | .41 | .59 |
| % Economically disadvantaged students who dropped out of school | 5,216 | 2.46 (13.80) | 19,564 | 2.66 (16.08) | -.19 | .62 | .76 |
| % NON-Economically disadvantaged students who dropped out of school | 5,312 | .67 (7.91) | 21,528 | 1.05 (10.21) | -.38 | .36 | .30 |

## Perceptions of Impacts of the Program on Staff and Students

In addition to measuring impact using student administrative data, we also explored stakeholder perceptions of the impact of the program using multiple sources of data, including the staff survey and site visits. We begin by presenting the findings from the impact survey and then share how staff and students discussed the impact of the program.

### Survey Results

On the staff survey, we asked participants to indicate the extent to which they agreed with a set of statements around the potential impacts of the program on school culture and students with response options ranging from “strongly disagree” (1) to “strongly agree” (4). Table V-8 presents the percentage of Michigan respondents who “agreed” or “strongly agreed” with six statements. The results are broken out by role type (i.e., all program teachers, STEM program teachers, and administrators).

*Table V-8. Perceptions of Impact on School Culture and Students—Michigan Respondents*

| Item | Respondent | Fourth Survey (2018) | | |
|---|---|---|---|---|
| | | n | Agree + Strongly Agree (%) | Mean |
| Because of SECEP, the staff in our school have higher expectations for all students. | All Program Teachers | 196 | 66.8 | 2.78 |
| | STEM Program Teachers | 92 | 67.4 | 2.79 |
| | Program Administrators | 26 | 73.1 | 2.85 |
| Because of SECEP, we see positive changes in student engagement, academics, or interest in STEM areas. | All Program Teachers | 197 | 70.6 | 2.84 |
| | STEM Program Teachers | 92 | 76.1 | 2.92 |
| | Program Administrators | 25 | 84.0 | 3.16 |
| Because of SECEP, there is an increased collaboration among teachers. | All Program Teachers | 197 | 60.9 | 2.69 |
| | STEM Program Teachers | 92 | 62.0 | 2.71 |
| | Program Administrators | 26 | 76.9 | 3.00 |
| Because of SECEP, trust and collaboration among all staff has improved. | All Program Teachers | 197 | 55.8 | 2.60 |
| | STEM Program Teachers | 92 | 55.4 | 2.60 |
| | Program Administrators | 26 | 69.2 | 2.88 |
| Because of SECEP, our school is more focused on a common vision and mission. | All Program Teachers | 196 | 64.3 | 2.74 |
| | STEM Program Teachers | 92 | 67.4 | 2.78 |
| | Program Administrators | 26 | 73.1 | 2.81 |
| Because of SECEP, relationships between teachers and students have improved. | All Program Teachers | 197 | 60.4 | 2.71 |
| | STEM Program Teachers | 92 | 60.9 | 2.72 |
| | Program Administrators | 26 | 69.2 | 2.88 |

A majority of respondents "agreed" or "strongly agreed" that SECEP had resulted in impacts on school culture and on students. The highest perceived impact was in the area of increasing student interest and engagement. Over 70% of all teachers and 80% of administrators "agreed" or "strongly agreed" that SECEP had resulted in positive changes in student engagement, academics, or interest in STEM areas. The area with the lowest agreement in terms of perceived impact for administrators (69.2%) and teachers (55.8%) was improvement of trust and collaboration among all staff.

## Site Visit Results

In addition to the survey, participants were asked to reflect on the impact of the program during interviews conducted as part of the site visits to eight schools across the four ISDs. These interviews expounded on many of the same themes seen in the survey.

### *Impacts on School Culture*

In three of the schools visited, staff reported that the grant facilitated the development of a more cohesive vision for their school. One staff member noted, "So, I think as a building we've come together a lot more. As a family instead of being individuals in a classroom." A colleague in the same school said, "I think this grant has helped in [unifying] the high school and…. Giving a common goal of how to step it up has provided ways, methods, ideas to help step it up."

A total of 21 staff in six schools described an increase in collaboration among teachers, primarily because of the need to coordinate and work together on projects being implemented by the school and the professional development opportunities provided by the grant. One staff

member noted, “...huge collaboration among teachers. They talk more. They're in the conferences more, so there's more communication about lessons, and ideas, and units.”

Nine respondents from six schools reported that teacher leadership had increased because of the opportunities the grant gave teachers, either to lead in-house professional development or to present at state and/or national conferences. As one principal said,

> I think this project has done wonders to build capacity within the staff, because it has allowed me to bring numerous staff members to national conferences and present, which they never would have. All of a sudden, you present at a national conference, and you get people coming and asking you questions and people coming up and shaking your hand and saying thank you and emailing you, "Hey, can you help me?" That builds the staff confidence. And it builds their self-image. So now, all of a sudden, in their minds, they're a leader in the educational community in this, whether it's coaching or inquiry instruction or a place-based education, all of which we've done presentations at the national level on.

A teacher in a different school described the impact this way:

> I went from being somebody who just followed directions and did what I felt was good enough to now, I'm looking for every opportunity to improve and do something interesting and new. I'm not worried about boxes, I'm not worried about putting in extra effort. I'm making things, which has inspired me to be better. I like this job more now because I'm doing things that I feel are valuable, rather than just following directions.

For one school, one of the primary benefits of the project has been the way in which their school has been perceived by the community. Five interviewees associated with that school commented that their school was being viewed more positively and, as a result, the district was beginning to attract more students:

> And so, I think now, having this emphasis on college readiness and being able to throw out numbers, to have data to say, like, "These are all our students right now that are dual enrolled. And this is how they're doing in their classes." That has positively impacted the view of our school.

On the other hand, faculty in a different school noted a general decline in school climate and culture because of the project, the Early College work, and the subsequent increase in students taking college courses. Three faculty at this school commented that the Early College was pulling higher achieving students out of the building, leaving lower-performing students behind. Two also noted that some high school positions were being lost and that fewer AP courses were being offered.

***Student Impacts***

Respondents reported a variety of student impacts coming from increased use of project-based learning, increased access to advanced courses, and a more postsecondary-oriented culture.

Fifteen interviewees from six schools described how the project has led to students paying increased attention to their postsecondary goals and have more of a vision for the future. One staff member said,

> I think just for so many of our kids in [our] schools, they thought that college was never an option for them, whether it's due to financial reasons or just low confidence. “My parents didn't go to college. I'm not smart enough to go to college.” I think we are starting to change that attitude in most of our students, well, many of our students. I think they're starting to see, once they get into college and they see that they're able to take classes, and they're passing the classes, and it's paid for, I think now they're starting to change their mindset.

Fourteen teachers from five different schools reported that the use of projects led to increased student engagement and active learning in the classroom. A high school staff member described the type of instruction she saw in a classroom whereby the teacher was implementing strategies from professional development received as part of the grant:

> I go into a science classroom. This is a science room in which I see students of all different levels. I've got some that greatly struggle, some that are high achieving. They're sitting in groups, they are working on white boards, the teacher has posted a friction example on the board and the students are diagramming it out, they're labeling, they're designing, they're doing different things and the discussions I'm seeing are phenomenal. I’m seeing students work together who never would have worked together in the past. I'm seeing students who weren’t participating that are now holding quality discussions with their peers and volunteering and reporting out.

High school students in one school noted that the use of more hands-on instruction had increased their interest in science. Six staff from two schools mentioned that the change in instruction was also leading to improved student behavior, with one school indicating that their number of suspensions had dramatically decreased.

Across all the high schools we visited, participants commented on the increase in students taking dual enrollment or other advanced courses. Also, across all the high schools, faculty members reported that students received positive benefits from those courses. For example, one staff member said, “It's giving some students whose family socio-economic status probably would have prevented them from going to college to get the opportunity to go, and I think that's powerful for those families.” A college faculty member agreed that students were leaving

high school more prepared for college, attributed, at least in part, to the increased exposure to college courses:

> So, these students are coming to college, not only are they getting credits, they're more prepared for, whether it's moving on to the university or staying at [the] college, they're more prepared for that work. We're noticing now, [that] students have a much better grasp of the career pathway because of the work in alignment and the current exploration that's being done at the districts as well.

One middle school reported that the expanded access to college courses in the high school had trickled down such that the middle school was offering more advanced courses:

> We're now teaching high school credits in the middle school. Computer, world language, and algebra I is now in the middle school, so those credits are being taken here, allowing more kids to take dual enrollment at the high school level, so some of their numbers that they're so proud of, which is an amazing increase, is attributed to this trickle-down through this grant that these kids are taking their credits early.

Although many perceived impacts were positive, two faculty members in one high school, believed that having students in dual enrollment courses meant that they were paying less attention to their high school courses. One faculty member commented:

> I've [had] to remind [students,] when they're in my class, and they've said, "Well, I've got this college paper due." Well, that's not more important than my class.... No, you can't be typing on a laptop, you need to be participating in what we're doing because it's necessary for you to pass my class.

In summary, the quantitative and qualitative data suggest that schools are making changes that are resulting in positive impacts in school culture and improving student outcomes. The next section presents results for Connecticut.

## SECTION VI: STUDENT IMPACTS—CONNECTICUT

This section presents the student impacts coming from the implementation of the project in Bridgeport, Connecticut. We present the research design used, the impact on core outcomes, and perceived impacts on students and staff.

Key findings concerning the impact of the project include the following.

- The impact study suffered from various design and data collection challenges that meant we could not make causal claims about the impact of SECEP on the schools. One of the key challenges was that the three treatment schools were among the most disadvantaged in Connecticut, which made it impossible to find comparison schools that were equivalent on both baseline measures of the outcomes and on demographic characteristics. Any findings need to be considered in light of these caveats.
- Both treatment and comparison schools had higher percentages of students taking college-level and CTE courses in Year 4 than in the baseline year, however, some of this was due to a change in reporting by Connecticut as CTE was included in the measure in Year 4 but not in the baseline year. When adjusted for differences in poverty and race, the estimated levels of enrollment were similar in both treatment and comparison schools.
- Dropout rates in the treatment schools increased over the life of the project; in comparison schools, dropout rates decreased. Differences between the two groups of schools were not statistically significant.
- Both treatment and comparison schools increased their 9$^{th}$-grade enrollments in college preparatory courses. When adjusted for initial differences in poverty and race, the increases were higher in the treatment schools, but the difference between the two groups was not statistically significant.
- Participants reported that the project had made a difference in their schools, including supporting the development of a more common vision and a more college-going culture.

### Methodology

The evaluation design of the impact of SECEP in Connecticut experienced several significant challenges resulting in an inability to make any clear causal claims about impact. First, SECEP was implemented in three of the most disadvantaged high schools in the state, which made it impossible to identify comparison schools that were well matched on both outcome and demographic characteristics. Second, these schools were all located in a single district, which means that any program impact estimates would be confounded with effects from the district. Third, despite extensive efforts, we were unable to obtain access to student-level data or school-level data that were customized to meet the design requirements of our evaluation; as a

result, we used publicly available school-level data, which significantly limited the opportunities for statistical modeling and the types of outcomes we could examine. Finally, because the treatment groups were so homogeneous, we did not conduct any sub-group analyses. The results that we present below should be considered in the light of these substantial limitations.

### Sample

The study sample in Connecticut included three treatment schools, all from Bridgeport. These schools were among the most disadvantaged in the state, with an average 99.7% poverty rate; only one other school in the state (which had broken into four small academies) had a similar poverty rate while the next closest was 14 percentage points lower. The treatment schools had an average of 89% minority enrollment rate. Nine schools (including the four small schools) had comparable minority rates but most of those schools (outside of the four small schools) were not similar on poverty. In terms of exploring baseline measures for outcomes, we were able to find schools that met WWC expectations for baseline equivalence for two of the outcomes measured—college credit coursetaking and dropout rates—but those schools were not comparable on demographic characteristics. We were unable to identify a set of schools fully comparable on baseline college preparatory coursetaking that were also somewhat similar in demographics. As a result, we decided to prioritize equivalence on the outcomes and then find as close a match as we could with demographic characteristics, recognizing that differences between the two groups of schools would not meet the WWC baseline equivalence standards. Despite the lack of equivalence on some measures, we believed, however, that the comparison schools would provide suggestive evidence regarding the impact of SECEP. Table VI-1 presents the baseline equivalence statistics for the three different samples used for the three different outcomes.

*Table VI-1. Baseline Equivalence, Treatment and Comparison Groups—Connecticut*

| | | Treatment | | Control | | Standard Deviation (Pooled) | Effect Size (Hedge's *g*) |
|---|---|---|---|---|---|---|---|
| Outcome | Measure | N | Mean (SD) | N | Ctrl Mean (SD) | | |
| College Credit Course Taking Sample | % College Credit Course Taking | 3 | 16.25 (8.12) | 9 | 16.73 (6.36) | 6.75 | .07 |
| | % Poverty | | 99.73 (.18) | | 63.39 (9.68) | 8.66 | 3.87 |
| | % Minority | | 89.31 (4.60) | | 72.50 (17.00) | 15.34 | 1.01 |
| Dropout | Cohort Dropout rate | 3 | 20.50 (6.51) | 10 | 20.66 (6.98) | 6.90 | .02 |
| | % Poverty | | 99.73 (.18) | | 84.42 (14.97) | 13.54 | 1.05 |
| | % Minority | | 89.31 (4.60) | | 83.25 (10.30) | 9.52 | .59 |
| Enrollment in college-ready math and English | % Enrollments in college preparatory math and English | 3 | 50.63 (7.71) | 4 | 53.37 (5.85) | 6.66 | .35 |
| | % Poverty | | 99.73 (.18) | | 60.68 (14.83) | 11.49 | 2.86 |
| | % Minority | | 89.31 (4.60) | | 65.31 (14.23) | 11.40 | 1.77 |

### Outcomes

All outcomes used publicly available school-level data, and, in cases of missing data, no outcomes or covariates were imputed. The following outcomes were examined:

- **Percentage of students enrolling in college credit-bearing or CTE courses.** This measure, which was calculated by the Connecticut Department of Education and was at the school level, examined the percentage of enrolled 11th- and 12th-grade students who took at least two AP, IB, dual enrollment, or CTE courses in the given school year. Outcome data are provided for the 2017-18 school year. It is important to note that CTE courses were not included in this measure in the baseline year, but they were included in 2017-18.
- **Cohort dropout rate.** This outcome was the four-year cohort dropout rate, calculated by the Connecticut Department of Education. These data were examined for the 2017-18 graduating cohort of students; most of these students would have been in 9th grade in 2014-15, the year in which SECEP started.
- **Percentage of course enrollments in college preparatory courses.** This outcome looked at the percentage of course enrollments taken by 9th graders that could be deemed as college preparatory. These courses include a college preparatory English course (English I or higher) and a college preparatory mathematics course (Algebra I, Algebra II, Geometry, Precalculus or any AP mathematics course). This measure was calculated by the evaluation team using publicly available data that included the number of enrollments by grade level and by specific course. Outcome data were for the 2017-18 school year.

### Analysis

As above, the analyses were conducted using SPSS (version 25). Impact analyses on the three outcomes were conducted at the school level using a series of Analysis of Covariance (ANCOVA) models with the outcome as the dependent variable while controlling for baseline measures of the relevant outcome, poverty percentage, and racial minority percentage.

### Results

The first outcome was the percentage of students taking college credit courses. As shown in Table VI-2, the SECEP schools and comparison schools provided similar levels of access to college credit/CTE courses (with estimated means of 67% for both). It is important to note that this school-level measure included CTE courses, which were not an emphasis of the intervention. Data collected by NCREST showed that dual enrollment/AP participation rates were approximately 15-17% in 2016-17, which suggests that the bulk of student participation was driven by CTE courses and not dual enrollment/AP courses.

As Table VI-2 also shows, SECEP expanded their enrollment in college preparatory courses at a higher rate than comparison schools when adjusted for demographic characteristics, although the difference was not statistically significant. Finally, dropout rates were higher in SECEP schools than in comparison schools by approximately five percentage points, although the difference was not statistically significant.

Because of the small sample sizes, none of the differences between treatment and comparison schools were statistically significant.

*Table VI-2. Estimated Student Impacts, Connecticut*

| Outcome (Year measured) | Treatment Model adjusted mean | Comparison Unadjusted mean | Adjusted impact estimate | p-value |
|---|---|---|---|---|
| % 11th and 12th graders taking at least two college credit or CTE courses (17-18) | 66.7% | 66.8% | -.1% | .99 |
| Cohort dropout rate (16-17) | 21.6% | 17.0% | 4.6% | .25 |
| % 9th-grade course enrollments in college preparatory courses (17-18) | 87.9% | 81.58% | 6.4% | .71 |

Note. The treatment mean was calculated by adding the impact estimate from the model to the unadjusted comparison mean; essentially, the model estimates what the mean for the treatment schools would be if they had the same levels of poverty and race/ethnicity as the comparison schools. No differences were statistically significant.

In considering these results, it is important to remember that the treatment and comparison schools were not fully comparable. Even when the schools started with similar levels of outcomes, the treatment schools had higher poverty rates and higher percentages of minority students. These findings suggest that schools in challenging environments can still make changes. There was an increase in dropout rates in treatment schools over the life of the project, which is concerning and should be an area of attention for the district moving forward.

## Perceptions of Impacts of the Program on Staff and Students

In addition to looking at outcomes using school-level administrative data, we also explored stakeholder perceptions of the impact of the program using multiple sources of data, including the staff survey and site visits. We begin by presenting the findings from the impact survey and then share how staff and students discussed the impact of the program.

### Survey Results

On the staff survey, we asked participants to indicate the extent to which they agreed with a set of statements around the potential impacts of the program on school culture and students. Response options ranged from “strongly disagree” (1) to “strongly agree” (4). Table VI-3 presents the percentage of respondents who “agreed” or “strongly agreed” with six statements. The results are broken out by role type (i.e., all program teachers, STEM program teachers, and administrators).

*Table VI-3. Perceptions of Impact on School Culture and Students, Connecticut*

| Item | Respondent | Fourth Survey (2018) | | |
|---|---|---|---|---|
| | | n | Agree + Strongly Agree (%) | Mean |
| Because of SECEP, the staff in our school have higher expectations for all students. | All Program Teachers | 80 | 73.8 | 2.80 |
| | STEM Program Teachers | 34 | 67.6 | 2.68 |
| | Program Administrators | 16 | 93.8 | 3.19 |
| Because of SECEP, we see positive changes in student engagement, academics, or interest in STEM areas. | All Program Teachers | 82 | 73.2 | 2.78 |
| | STEM Program Teachers | 35 | 62.9 | 2.60 |
| | Program Administrators | 16 | 81.3 | 3.19 |
| Because of SECEP, there is an increased collaboration among teachers. | All Program Teachers | 81 | 72.8 | 2.84 |
| | STEM Program Teachers | 35 | 71.4 | 2.71 |
| | Program Administrators | 16 | 81.3 | 3.06 |
| Because of SECEP, trust and collaboration among all staff has improved. | All Program Teachers | 80 | 68.8 | 2.78 |
| | STEM Program Teachers | 34 | 64.7 | 2.65 |
| | Program Administrators | 15 | 80.0 | 3.07 |
| Because of SECEP, our school is more focused on a common vision and mission. | All Program Teachers | 81 | 76.5 | 2.88 |
| | STEM Program Teachers | 34 | 76.5 | 2.82 |
| | Program Administrators | 16 | 81.3 | 3.06 |
| Because of SECEP, relationships between teachers and students have improved. | All Program Teachers | 82 | 70.7 | 2.71 |
| | STEM Program Teachers | 35 | 60.0 | 2.54 |
| | Program Administrators | 16 | 81.3 | 3.13 |

A majority of respondents "agreed" or "strongly agreed" that SECEP had resulted in impacts on school culture and on students. The highest perceived impact was in the area of developing a common vision and mission for the school, followed by increased expectations for students and higher student engagement. Over 70% of all teachers and 80% of administrators "agreed" or "strongly agreed" that SECEP had resulted in positive changes in student engagement, academics, or interest in STEM areas. The area with the lowest agreement in terms of perceived impact for administrators (80.0%) and teachers (68.8%) was improvement of trust and collaboration among all staff.

## Site Visit Results

According to interviews, the SECEP project has led to impacts and changes at both the staff and student levels in Bridgeport.

### *Impact on School Culture*

Ten staff from all four of the schools we visited noted that the grant has given a common focus to the schools that has resulted in increased communication and collaboration among teachers and, for three of the schools, between teachers and administrators. As one teacher noted,

> With our i3 meetings, I see a lot more collaboration between grade levels. And then also between content areas. So, I would not have been exposed to talking to elective class teachers about instructional strategies and observing their classes, or I would not have so much conduit to 10th-grade teachers who are teaching the students we had last

> year.... Just having that common planning time and having those meetings helps us to talk about [what I did] last year, so they know where they're coming from.

One district staff member, however, did express concerns that, because the collaboration was driven primarily by participation in project activities, these changes might not last beyond the grant.

Representatives from three of the four schools believed that there was an increase in teacher leadership, primarily centered around sharing results from the project professional development and in taking more ownership around selecting professional development and, in one school, supporting instructional rounds. As a school leader described,

> What we've seen is that some teachers have really stepped up into making sure that they had their say as to how this is implemented; sharing ideas, planning, as well as debriefing, and one of the large areas that we've done and expanded on...is to go to the classroom rounds where teachers are going around and observing each other's lessons and then giving feedback to each other and, as administrators, we've taken a step back…. It's a different experience when the administrators aren't involved directly in this and we've allowed them to do this.

In one school, the principal noted that the grant has increased expectations of the leadership team to become more instructional leaders.

***Impact on Students***

Relative to student experiences, staff in both high schools commented that students were paying increased attention to what happens after high school. In one school, the staff described their school as having more of a college-going culture. In the other high school, two staff and two students noted that there was more of an orientation around one's future among the students. As a faculty member said,

> One huge change from my first year…is that, not only are the classrooms full, but students are interested in learning and they want to have more knowledge, and even though I have sophomores, they are already focused on, "When I leave high school, I want to study this..." or they have an idea of having a future, where some of the students I had two years ago couldn't think that they would even graduate let alone to think about the next step past graduation.

Overall, the grant was perceived to afford more opportunities for students to take college courses.

Staff from all four schools also believed that teachers were implementing the targeted instructional practices and that those practices were leading to increased student engagement. One teacher commented,

> I've seen students become more involved and I've been able to design activities where they can show me what they know, where they're able to do the work independently, and so they are drawing their own conclusions, making their own connections, and I've seen much more meaningful learning that way.

Staff from two schools noted that the changing instructional practices have also led to improved teacher-student relationships and improved student attendance. One teacher said,

> I just feel like the relationships within the building have changed so much in the past two years. I remember times when my first period class would have three people in it, now, by the first bell, rarely are there less than 20. We had 400 students, I think it was, in the first marking period with perfect attendance, which is almost 40% of our population and, to me, a great number of students that [show] up every day and really care about their education.

Faculty from three of the schools reported that student achievement was rising because of increased student engagement with the content. One teacher noted, “With the strategies and projects and making it more student-centered…it's great to see those light bulbs go off because they discovered it. Then I've found that because they discovered it, they remember it.”

As previously mentioned, the Connecticut study design had substantial challenges, thus, we cannot make any causal claims about the impact of the intervention. Overall, however, results suggest that the Bridgeport schools made some changes because of SECEP but that those changes were not sufficient to increase outcomes above and beyond what other schools in the state were already doing. It is important to remember that the SECEP schools faced considerable challenges in terms of poverty and historically low performance. Additionally, the descriptive increase in cohort dropout rates for treatment schools remains an area of concern. Although we are not convinced that the intervention caused an increase in dropout rates, the findings suggest that dropout prevention should be a key focus area for the district moving forward.

## SECTION VIII: DISCUSSION AND CONCLUSION

SECEP was the first large scale effort to take lessons learned from the successful small Early College Model, merge them with a STEM focus, and apply them in comprehensive high schools. Project staff executed a key set of implementation support strategies—including technical assistance, coaching, professional development, management teams, an online COP, and support to high school-college partnerships—that were intended to assist schools in implementing the four STEM Early College Design Principles.

The effort was designed to increase the number of students completing high school with at least one college credit and to better prepare students in STEM. Past studies have suggested that implementing change in comprehensive high schools can be a challenging task (American Institutes of Research & SRI International, 2008; Edmunds et al., 2018; Mazzeo, Fleischman, Heppen, & Jahangir, 2016). Results from this evaluation suggest that schools *can* change their practices in ways that improve student outcomes but that there are also issues that need to be considered in moving this work forward.

### Changes in Schools

Survey and site visit data showed that participating schools did make changes in implementation of the Design Principles, particularly related to a STEM College-Focused Academic Program, High School-College Collaboration, and a Culture of Continuous Improvement.

### STEM College-Focused Academic Program

The schools reported implementing more college courses, developing STEM pathways, increasing college readiness activities and changing instructional practices. In Michigan, each district had at least one Early/Middle College, which provided extensive access for the students enrolled in that school. Across both states, schools had students enrolled in STEM-focused pathways that spanned high school and college often in engineering, information technology, medical fields, or advanced manufacturing areas. On the surveys, administrators reported significant increases in the percentage of students on track to earn college credits while in high school.

In addition to expanding access to college courses, all middle and high schools in both states focused on academic preparedness and college and career awareness and aspirations. High schools in both states offered a variation of a college readiness course, which focused on academic college skills (soft skills) and college knowledge. Some schools taught these skills in a separate class whereas others embedded them in regular subject classes. Students in both states found these classes helpful.

Across both states, there have been reported changes in instruction in all schools. In Bridgeport, schools implemented the CIF strategies, and in Michigan, schools focused on implementing project-based and inquiry learning. While all teachers we interviewed implemented new instructional strategies, the survey results suggest that not all teachers in the schools had embraced the changes.

### Student Support

Across both states, schools increased the supports provided to students taking college courses, providing additional tutoring or monitoring students' performance in college classes. There was also an increase in collaboration with the colleges around supports. There was no indication, however, that schools made substantial changes in the types of supports they provided relative to high school courses. While academic and postsecondary support appeared to be more formal, there seemed to be a less systematic approach for affective support (except for one emotional support intervention in Bridgeport that was not part of SECEP although it was seen as complementary).

### High School-College Collaboration

In both Bridgeport and Michigan, it was evident that the grant had increased the number of postsecondary partners and strengthened ongoing partnerships. Across both states, there was a clear expectation that this would be one of the most sustainable parts of the grant. A staff member in Michigan said, "It is going to be a great partnership because we're so intertwined."

### Culture of Continuous Improvement

Schools increased their use of data as part of the SECEP project, primarily focused on college courses. Schools also reported using and appreciating the range of data provided by NCREST through its data analysis and training. Teacher collaboration was also a component of continuous improvement; there was disagreement here, however, between the interview and the survey data. The survey showed no changes in collaboration over time, while the interviews indicated that there was much more collaboration, at least, in part, because teachers were trying to implement more interdisciplinary projects with their colleagues.

## Impacts on Students

As described above, the comprehensive schools in this project made changes to their schooling environment, increasing the emphasis on college-going and working to implement changes in instructional practices. The changes made by the schools were expected to lead to improved student outcomes. To test these hypotheses, the evaluation study had to conduct two separate impact studies, broken out by state. This turned out to be appropriate and necessary given that the context and implementation varied substantially by state. Due to the challenges with the

Connecticut impact analyses, however, we focus this discussion primarily on the results from Michigan.

In the Michigan schools, we saw an overall positive impact on students' earning college credits. The percentage of students who earned at least one college credit was 12 percentage points higher in the SECEP schools than in the comparison schools (29.8% vs. 17.5%). Students in SECEP schools earned approximately double the number of college credits as students in comparison schools (3.5 vs. 1.8).

Evidence from the Michigan impact study suggests that enrollment in dual credit courses may have come somewhat at the expense of enrollment in AP courses. For example, the percentage of students enrolled only in dual credit courses was 13 percentage points higher than in the comparison schools, while the percentage enrolling only in AP courses was nine percentage points lower. However, study results also suggest that enrollment in dual credit courses made it more likely that a student would earn potential college credit. We found a very small proportion of our sample scoring sufficiently high on AP exams to earn college credit while over 90% of the students taking dual credit courses received a passing grade. Of course, it is important to acknowledge that earning actual credit, whether through dual enrollment courses or AP exams, always depends on the college or university granting that credit.

There is also evidence from Michigan that dual enrollment was not reaching all students equally, particularly with regard to minority students. The project impacts were smaller for minority students and minority students were less likely to enroll in dual enrollment courses than non-minority students. These findings are consistent with other literature that has shown that expansion of dual enrollment opportunities often comes first to white or more advantaged students, resulting in concerns about equity (Miller et al., 2018; Pierson, Hodara, & Luke, 2017). These data suggest that schools will want to regularly look at the characteristics of their dual enrollment students to ensure that there is equity in their coursetaking opportunities.

The heightened college-going culture was intended to give students a better sense of their future and encourage them to remain in school. The dropout data showed descriptively lower dropout rates in SECEP schools, although the difference was not statistically significant.

Overall, results from the SECEP study show that comprehensive high schools can make significant changes to their culture and their instruction. The hope is that these changes will lead to more students graduating from high schools prepared to enroll in, and be successful in, careers or further postsecondary education.

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## APPENDIX A: SURVEY

*Summary of Survey Scales' Properties and Questions*

| Staff Scale | $\alpha$ | Questions on the Scale (T – teachers only, A – administrators only, T, A – all staff) | Response Options |
|---|---|---|---|
| SECEP Program Understanding and Buy-in (T, A[5]) | .88 | - I understand the goals and objectives of the SECEP program that is being implemented in our school. (T, A)<br>- Most staff in our school understand the goals and objectives of SECEP program. (T, A)<br>- A team of staff and administrators participated in developing goals for effective STEM Early College education in our school. (T, A)<br>- I believe that our school should prepare students for postsecondary education and careers, with an emphasis on STEM fields. (T)<br>- I have made focused efforts to align my lessons with college expectations. (T)<br>- All staff in this school share a goal of preparing every student for postsecondary education without remediation. (T, A)<br>- Teachers make focused efforts to align their lessons with college expectations. (A)<br>- I am aware of our school's academic plan or scope & sequence that shows students how they can earn college credits by high school graduation. (T, A)<br>- All staff in this school share a goal of preparing students for STEM-focused postsecondary education or careers. (T, A)<br>- I am aware of our school's pathways or sequences of high school and college courses leading to STEM college majors. (T, A)<br>- Our school has a school-wide initiative to improve STEM teaching strategies. (T, A)<br>- All staff are committed to providing necessary supports to ensure that students are prepared for postsecondary education and careers with an emphasis on STEM. (T, A) | 1 = Strongly Disagree<br>2 = Disagree<br>3 = Agree<br>4 = Strongly Agree |
| College-going Expectations (T, A) | .81 | - Most faculty and staff in this school expect every student to receive at least some postsecondary education or training.<br>- Most faculty and staff in this school believe that, if given enough support, all students can successfully complete college preparatory courses.<br>- Our school explicitly and purposefully focuses on building students' postsecondary aspirations.<br>- Our school explicitly and purposefully focuses on helping students to identify their future career directions. | |
| College Readiness (T, A) | .84 | - The school has clearly articulated goals for academic college readiness (such as content knowledge, writing, reading, and critical thinking skills, etc.).<br>- The school shared these goals for academic college readiness with all staff.<br>- There are school-wide rubrics (or other guidelines) staff can use to measure academic college readiness of their students.<br>- Staff incorporates measures of academic college readiness into their classroom. | 1 = Not True at All<br>2 = Somewhat True<br>3 = Mostly True<br>4 = Entirely True |
| School Academic and Social-Emotional Support (T, A) | .85 | - Our school has a system to identify students in need of academic support.<br>- Our school has a system to identify students in need of social/emotional support.<br>- I am aware of supports that the college provides to students taking college courses.<br>- Our school has a system to provide support to students taking college courses.<br>- The high school and college collaborate on providing support to students in college courses.<br>- The school makes efforts to increase family engagement in students' academic life.<br>- Faculty or staff members follow up when students miss their classes. | |

[5] "T" indicates teacher items and "A" indicates administrator items.

| Staff Scale | $\alpha$ | Questions on the Scale (T – teachers only, A – administrators only, T, A – all staff) | Response Options |
|---|---|---|---|
| Staff Academic and Social-Emotional Support (T, A) | .78 | - I regularly provide academic supports to students who need it.<br>- I regularly provide social and/or emotional supports to students who need it.<br>- Most staff regularly provide academic supports to students who need it.<br>- Most staff regularly provide social and/or emotional supports to students who need it. | |
| College Readiness Skills | .76 (T)<br>.92 (A) | (A) How frequently have most of your students received explicit training in the following areas:<br>- Time management<br>- Note taking<br>- Organizational skills<br>- Advocating for themselves with high school and college faculty.<br>(T) In the current school year, how often have you:<br>- Worked with students on time management and study skills?<br>- Worked with students on organizational skills?<br>- Expected students to take detailed notes on a lecture or presentation?<br>- Encouraged students to advocate for themselves with high school and college faculty? | 1=Never<br>2=A Few Times This Year<br>3=Once or Twice a Month<br>4=Once or Twice a Week<br>5=Almost Every Day |
| Rigorous Instruction | .84 | (T) In the current school year, how often have you:<br>(A) How frequently have most of your teachers implemented the following instructional practices?<br>- Encouraged students to find more than one way to answer a question?<br>- Had students develop and analyze multiple solutions to a problem?<br>- Asked students to defend their own ideas or point of view in writing or in a discussion?<br>- Asked students to explain their thinking?<br>- Asked students to engage in in-depth discussions about what they have read or learned?<br>- Asked students to analyze or interpret documents or data? | |
| Inquiry, Project-Based Learning | .82 | (T) In the current school year, how often have you:<br>(A) How frequently have most of your teachers implemented the following instructional practices?<br>- Asked students to solve problems based on life outside of school?<br>- Asked students to develop and/or test a theory or hypothesis?<br>- Had students develop their own questions and then answer them?<br>- Implemented projects in their classrooms?<br>- Asked students to do a formal oral presentation?<br>- Had students collaborate on projects or assignments?<br>- Asked students to read subject-related texts that are difficult or complex?<br>- Asked students to write subject-related essays longer than 5 pages? | |
| High School and College Collaborations (T, A) | .90 | This school year, how often did you meet with college faculty:<br>- to discuss student support.<br>- to understand college expectations in my subject area.<br>- to improve student opportunities to study in STEM areas.<br>- to establish curriculum alignment.<br>- For joint professional development with college faculty. | 1 = Never<br>2 = 1 - 2 Times<br>3 = 3 - 6 Times<br>4 = More Than 6 Times |
| Local College Support (T, A) | .89 | To what extent have you or your school received the following resources/supports from your local college over the past year?<br>- Financial resources<br>- Access to college facilities<br>- Guest speakers<br>- Curriculum materials<br>- Research or internship opportunities<br>- College awareness materials<br>- Professional development<br>- College courses | 1 = None<br>2 = A little<br>3 = A fair amount<br>4 = A lot |

## APPENDIX B: INTERVIEW PROTOCOLS

*Table B-1. Interview Questions Crosswalk Across Respondents*

| Construct | | HS Princip | HS Teach | MS Princip | MS Teach | Distr. Staff | Coun-selor | College Staff | Coach |
|---|---|---|---|---|---|---|---|---|---|
| Total number of questions (not including surveys) | | 20 | 16 | 17 | 16 | 16 | 16 | 15 | 17 |
| Focus of work | What was the focus of your work related to the SECEP project in the current school year? | X | X | X | X | X | X | X | X |
| STEM college-focused academic program | What instructional coaching have you received/provided during this school year? | | X | X | X | | | | X |
| | Please describe your school's efforts over the past two years to expand access to college courses for more students and proportion of students currently impacted by these efforts. | X | | | | X | X | X | |
| | Please describe your school's efforts over the past two years to improve students' college readiness skills and proportion of students currently impacted by these efforts. | X | X | X | X | X | X | X | X |
| | Please describe your school's efforts over the past two years to create STEM and other pathways that span high school and college courses and proportion of students currently impacted by these efforts. | X | | | | X | X | X | |
| | Please describe your school's efforts over the past two years to change STEM instruction, and instruction in other subjects and proportion of students currently impacted by these efforts. | X | X | X | X | | | | X |
| Academic and social supports to students | Please describe your school's efforts to expand academic and social supports to your students as a result of this project and proportion of students currently impacted by these efforts. | X | X | X | X | | X | X | X |
| Partnerships | Please describe how the partnership with your postsecondary partner(s) has evolved during the past year. | X | | | | X | X | X | |
| Use of data to improve student outcomes | To what extent are teachers provided time for common planning and collaboration? | | X | | X | | | | X |
| | How are you using data differently as a result of this project? As a probe: do you share data between high school and college? | X | X | X | X | X | X | X | X |
| Impacts | Other than what you have described above, how has this project impacted any aspects of your school, teachers', or your own work over the past four years? | X | X | X | X | X | X | X | X |
| | What are the impacts of the SECEP program on students? | X | X | X | X | | X | | X |
| | [Participants respond to a survey on impact of the project on organizational culture shift. The next question refers to this survey.] | | | | | | | | |
| | Would you say that the project resulted in some shifts in organizational culture, and if so, in which ways? | X | X | X | X | X | X | | X |
| | What do you see as impacts of this project on your community college? | | | | | | | X | |

| Construct | | HS Princip | HS Teach | MS Princip | MS Teach | Distr. Staff | Coun-selor | College Staff | Coach |
|---|---|---|---|---|---|---|---|---|---|
| Total number of questions (not including surveys) | | 20 | 16 | 17 | 16 | 16 | 16 | 15 | 17 |
| | What kinds of support did you receive from MCNC/JFF, district or school staff in implementing activities related to SECEP? | X | | X | | X | X | | X |
| | How useful was the support? What other kinds of support would you have liked to have? | X | | X | | X | X | | X |
| Support and Monitoring | How does the school monitor implementation of the SECEP Design Principles? Did you use the SECEP Design Principles Self-Assessment rubric? | X | | X | | | | | |
| | To what extent are teachers expected to implement the new strategies? To what extent is their instruction monitored for these practices? | | X | | X | | | | X |
| | What role did monitoring and accountability play in the implementation of SECEP? (Probes: monitoring by the project, by the district, by the principal). | | | | | X | | | |
| Buy-in and Sustainability | [Participants are asked to respond to a brief survey evaluating the capacity for sustainability of Design Principles. The next questions refer to this survey.] | | | | | | | | |
| | Please comment on your responses for how likely are various components of SECEP to be sustained after the grant ends. | X | X | X | X | X | X | X | X |
| | What features of SECEP were most likely to be supported by school leaders and teachers and why? | | | | | X | | | X |
| | Are you convinced that the STEM Early College approach is worth implementing? If so, what convinced you? | X | X | X | X | | X | X | |
| Reflection | Looking back at the SECEP implementation, which were the most effective strategies used to support implementation of the program? | X | X | X | X | X | X | X | X |
| | Were there specific implementation strategies that you would not recommend using if you were going to implement this program in the future? | X | X | X | X | X | X | X | X |
| | Is there anything else you'd like to tell us? | X | X | X | X | X | X | X | X |

## APPENDIX C: COMPLETED PATHWAYS

*Pathways Created or Revised Over the Life of SECEP Project*

| District | Pathways |
|---|---|
| Bridgeport | Bassick<br>- Advanced Manufacturer<br>- Revised Business Academy<br>- Revised FAME Academy<br>- Revised Sci Tech Academy<br>- Healthcare Career and College Readiness Program<br><br>Central<br>- Business Management and Hospitality<br>- Arts and Media<br>- Revised Government, Public Administration, & Safety<br><br>Harding<br>- Revised IB Law Careers Academy<br>- Revised Culinary Arts<br>- Revised Health Careers Magnet Academy |
| Delta Schoolcraft ISD<br>- Escanaba<br>- Bark River | AA, AAS and Certificate pathways:<br>- Arts and Design<br>- Business Administration<br>- Automotive Technology<br>- Computer Network Systems and Security<br>- Environmental Management<br>- Water Resource Management<br>- Mechanical Engineering<br>- Pre-Professional Health<br>- Welding Certificate<br>- Transfer Student Generic<br>- Engineering<br>- Elementary Education – Mathematics/Integrated Sciences Minor<br>- Elementary Education – Language Arts<br>- (Bark River & Escanaba) Early Childhood Education<br>- Automotive Pathway<br>- Welding Pathway |
| Genesee<br>- Carman Ainsworth<br>- Clio | Carman Ainsworth Early Middle Program @ Baker College<br>- Automotive Services<br>- Criminal Justice<br>- Advanced Manufacturing<br>- Photonics and Laser Technology<br>- Computer Programming<br><br>Carmen Ainsworth STEM Early College @ University of Michigan-Flint<br>- Medical Sciences Pathway<br>- Pre-engineering Pathway<br>- Health Sciences<br><br>Clio (DEEP enrollees) @ University of Michigan-Flint<br>- Medical Science Pathway<br>- Health Sciences<br>- Engineering<br>- Law<br><br>Clio & Carmen-Ainsworth/Genesee County Career and Technical Education Early Middle College<br>- Computer Occupations Technology – Applications Developer<br>- Computer Occupations Technology – Computer Security<br>- Nursing, AAS Prerequisites<br>- Automotive Technology<br>- Industrial & Manufacturing Technology AAS |
| Lapeer<br>- Almont<br>- Dryden | Almont, Imlay and North Branch<br>- 5-year STEMM Academy Plan @ Baker College<br>- 5-year CTE Blend @ Baker College |

| District | Pathways |
|---|---|
| - Imlay City<br>- North Branch Area | Dryden (same pathways as the other 3 districts, submitted form with a different title)<br>- Early College<br>- STEMM Early College Technical Track<br>- STEMM Early College Medical Track<br><br>Almont, Dryden, Imlay and North Branch/STEMM Academy (Early/Middle College—Science, Technology, Engineering, Mathematics & Medical) & Baker College of Flint<br>- Engineering/Technology Programs<br>- Health Science Programs<br>- Nursing Programs |
| Washtenaw<br>- Ypsilanti | - Automotive Services Technician Certificate<br>- Collison Repair Certificate<br>- Baking & Pastry Certificate<br>- Culinary Arts Certificate<br>- Child Development Associate Certificate<br>- Health Care Foundations Certificate (2 excel sheets)<br>- Introduction to Manufacturing Processes Certificate<br>- Machine Tool Set-Up and Operations<br>- Fluid Power (Pre-Mechatronics)<br>- Machine Tool Programming (Pre-Mechatronics)<br>- Industrial Electronics Technology<br>- Welding & Fabrication Principles Certificate<br>- Computer Systems Technology Certificate<br>- MEMCA Certificate<br>- Michigan Transfer Agreement Certificate<br>- Aviation Airframe & Powerplant Technician Certificate<br>- Energy Technician Certificate |

## APPENDIX D: BASELINE EQUIVALENCE BY SUB-GROUP, MICHIGAN

*Table D-1. Baseline Equivalence, Treatment and Comparison Groups, Michigan--Minority*

| Measure | Treatment Mean (SD) [N] | Comparison Mean (SD) [N] | Standard Deviation (Pooled) | Effect Size |
|---|---|---|---|---|
| Cohort dropout rate | .022 (.14) [2,033] | .013 (.11) [7,961] | NA | .33 |
| % of 11th- and 12th-grade students receiving at least one college credit | .015 (.083) [864] | .015 (.121) [3,471] | N/A | .02 |
| Average college credits earned | .169 (1.23) [864] | .091 (1.06) [3,471] | 1.10 | .07 |
| % Economically Disadvantaged | .717 (.458) [2,033] | .702 (.439) [7,961] | N/A | .05 |

*Table D-2. Baseline Equivalence, Treatment and Comparison Groups, Michigan—Non-Minority*

| Measure | Treatment Mean (SD) [N] | Comparison Mean (SD) [N] | Standard Deviation (Pooled) | Effect Size |
|---|---|---|---|---|
| Cohort dropout rate | .008 (.095) [4,534] | .009 (.101) [17,411] | N/A | .013 |
| % of 11th- and 12th-grade students receiving at least one college credit | .086 (.274) [2,157] | .087 (.282) [8,398] | N/A | .01 |
| Average college credits earned | .565 (2.16) [2,157] | .605 (2.56) [8,398] | 2.48 | .02 |
| % Economically Disadvantaged | .372 (.491) [4,534] | .403 (.487) [17,411] | N/A | .08 |

*Table D-3. Baseline Equivalence, Treatment and Comparison Groups, Michigan—Economically Disadvantaged*

| Measure | Treatment Mean (SD) [N] | Comparison Mean (SD) [N] | Standard Deviation (Pooled) | Effect Size |
|---|---|---|---|---|
| Cohort dropout rate | .018 (.14) [3,254] | .017 (.13) [12,644] | | .03 |
| % of 11th- and 12th-grade students receiving at least one college credit | .031 (.160) [1,374] | .028 (.165) [5,396] | N/A | .05 |
| Average college credits earned | .238 (1.30) [1,374] | .206 (1.55) [5,396] | 1.50 | .02 |
| % Minority | .506 (.496) [3,254] | .438 (.499) [12,644] | N/A | .17 |

*Table D-4. Baseline Equivalence, Treatment and Comparison Groups, Michigan—Not Economically Disadvantaged*

| Measure | Treatment Mean (SD) [N] | Comparison Mean (SD) [N] | Standard Deviation (Pooled) | Effect Size |
|---|---|---|---|---|
| Cohort dropout rate | .008<br>(.074)<br>[3,313] | .005<br>(.070)<br>[12,728] | N/A | .26 |
| % of 11th- and 12th-grade students receiving at least one college credit | .100<br>(.284)<br>[1,647] | .097<br>(.296)<br>[6.473] | N/A | .02 |
| Average college credits earned | .686<br>(2.34)<br>[1,647] | .661<br>(2.66)<br>[6.473] | 2.60 | .01 |
| % Minority | .220<br>(.387)<br>[3,313] | .184<br>(.369)<br>[12,728] | N/A | .14 |

## APPENDIX E. SUB-GROUP IMPACTS, MICHIGAN

*Table E-1. Impacts for 11th Graders, Michigan*

| Outcome | *Treatment* (N=3,866) Adjusted Mean (SD) | *Comparison* (N=15,272) Unadjusted Mean (SD) | Adjusted Impact Estimate at Year 4 | Impact Estimate Standard Error | p-value |
|---|---|---|---|---|---|
| % enrolled in any college course | 35.45 (45.27) | 28.70 (45.24) | 6.75 | 4.29 | 0.123 |
| % 11th enrolled in dual enrollment courses only | 15.58 (33.53) | 4.54 (20.83) | 11.03 | 3.87 | 0.006 |
| % enrolled in AP courses only | 15.73 (31.95) | 22.37 (41.68) | -6.64 | 4.40 | 0.138 |
| % enrolled in both AP and dual enrollment courses | 4.25 (20.33) | 1.78 (13.23) | 2.47 | 1.20 | 0.044 |
| % receiving at least one college credit | 21.04 (39.51) | 11.42 (31.81) | 9.62 | 3.07 | 0.003 |
| % receiving at least one college credit—dual enrollment only | 16.25 (36.68) | 5.71 (23.20) | 10.54 | 3.36 | 0.003 |
| % receiving at least one college credit—AP only | 4.03 (15.88) | 5.32 (22.45) | -1.29 | 1.58 | 0.418 |
| % receiving at least one college credit—both AP and dual enrollment | 0.71 (8.63) | 0.39 (6.20) | 0.33 | 0.34 | 0.336 |
| # college credits earned | 1.77 (4.12) | 0.89 (3.26) | 0.88 | 0.29 | 0.003 |
| # college credits earned—dual enrollment only | 1.37 (3.91) | 0.46 (2.26) | 0.91 | 0.31 | 0.006 |
| # college credits earned — AP only | 0.39 (1.28) | 0.42 (2.39) | -0.03 | 0.15 | 0.812 |

*Table E-2. Impacts for 12th Graders, Michigan*

| Outcome | Treatment *(N=3,706)* Adjusted Mean (SD) | Comparison *(N=14,815)* Unadjusted Mean (SD) | Adjusted Impact Estimate at Year 4 | Impact Estimate Standard Error | p-value |
|---|---|---|---|---|---|
| % enrolled in any college course | 48.98 (49.90) | 41.88 (49.34) | 7.10 | 5.23 | 0.181 |
| % 11th enrolled in dual enrollment courses only | 21.60 (36.11) | 8.73 (28.23) | 12.87 | 4.99 | 0.013 |
| % enrolled in AP courses only | 18.85 (40.24) | 28.15 (44.97) | -9.30 | 6.29 | 0.146 |
| % enrolled in both AP and dual enrollment courses | 8.69 (31.27) | 5.00 (21.80) | 3.69 | 2.42 | 0.133 |
| % receiving at least one college credit | 31.57 (44.76) | 20.26 (40.19) | 11.32 | 3.64 | .003 |
| % receiving at least one college credit—dual enrollment only | 23.91 (41.31) | 11.91 (32.39) | 12.01 | 4.39 | 0.009 |
| % receiving at least one college credit—AP only | 4.84 (16.67) | 7.24 (25.92) | -2.40 | 1.80 | 0.189 |
| % receiving at least one college credit—both AP and dual enrollment | 2.87 (17.12) | 1.11 (10.46) | 1.77 | 0.79 | 0.029 |
| # college credits earned | 4.17 (9.21) | 2.13 (6.16) | 2.04 | 0.51 | 0.000 |
| # college credits earned—dual enrollment only | 3.50 (8.96) | 1.38 (5.04) | 2.12 | 0.59 | 0.001 |

| Outcome | Treatment *(N=3,706)* Adjusted Mean (SD) | Comparison *(N=14,815)* Unadjusted Mean (SD) | Adjusted Impact Estimate at Year 4 | Impact Estimate Standard Error | p-value |
|---|---|---|---|---|---|
| # college credits earned — AP only | 0.67 (1.71) | 0.75 (3.65) | -0.09 | 0.22 | 0.687 |

## *Table E-3. Impacts for Minority Students, Michigan*

| Outcome | Treatment (N=1,527) Adjusted Mean (SD) | Comparison (N=6,694) Unadjusted Mean (SD) | Adjusted Impact Estimate at Year 4 | Impact Estimate Standard Error | p-value |
|---|---|---|---|---|---|
| % enrolled in any college course | 34.20 (43.40) | 33.58 (47.23) | 0.62 | 5.44 | 0.910 |
| % 11th enrolled in dual enrollment courses only | 12.08 (30.81) | 3.84 (19.22) | 8.24 | 3.47 | 0.023 |
| % enrolled in AP courses only | 19.61 (31.71) | 26.73 (44.26) | -7.12 | 5.39 | 0.193 |
| % enrolled in both AP and dual enrollment courses | 2.95 (17.63) | 3.02 (17.11) | -0.07 | 1.23 | 0.953 |
| % receiving at least one college credit | 14.68 (33.96) | 8.90 (28.48) | 5.78 | 3.00 | 0.062 |
| % receiving at least one college credit—dual enrollment only | 12.95 (32.79) | 5.84 (23.45) | 7.11 | 3.13 | 0.029 |
| % receiving at least one college credit—AP only | 0.94 (8.83) | 2.49 (15.60) | -1.56 | 1.05 | 0.144 |
| % receiving at least one college credit—both AP and dual enrollment | 0.51 (5.11) | 0.57 (7.51) | -0.06 | 0.54 | 0.913 |
| # college credits earned | 1.31 (4.41) | 0.78 (3.75) | 0.53 | 0.47 | 0.263 |
| # college credits earned—dual enrollment only | 1.16 (3.42) | 0.59 (1.32) | 0.57 | 0.50 | 0.256 |
| # college credits earned —AP only | 0.10 (0.57) | 0.19 (1.52) | -0.09 | 0.09 | 0.362 |

Note. A careful reader may wonder why the % enrolled in dual enrollment courses only is lower than the % receiving at least one college credit only through dual enrollment. This is because individuals who are receiving credit only through dual enrollment may also have been simultaneously enrolled in AP courses (and thus show up in the percentage of students enrolled in both AP and dual enrollment courses) but did not receive credit from those AP courses; for that reason, they would then be included in the % receiving credit only from dual enrollment courses, even though they were enrolled in AP courses.

*Table E-4. Impacts for Non-Minority Students, Michigan*

| Outcome | Treatment (N=3,703) Adjusted Mean (SD) | Comparison (N=14,169) Unadjusted Mean (SD) | Adjusted Impact Estimate at Year 4 | Impact Estimate Standard Error | p-value |
|---|---|---|---|---|---|
| % enrolled in any college course | 45.95 (50.01) | 39.35 (48.86) | 6.59 | 4.99 | 0.193 |
| % 11th enrolled in dual enrollment courses only | 20.89 (37.75) | 9.15 (28.83) | 11.75 | 4.75 | 0.017 |
| % enrolled in AP courses only | 16.39 (39.89) | 25.73 (43.71) | -9.34 | 5.50 | 0.097 |
| % enrolled in both AP and dual enrollment courses | 8.63 (33.20) | 4.48 (20.69) | 4.15 | 2.25 | 0.072 |
| % receiving at least one college credit | 32.29 (46.65) | 21.53 (41.10) | 10.77 | 3.69 | 0.005 |
| % receiving at least one college credit—dual enrollment only | 23.65 (43.37) | 11.91 (32.40) | 11.74 | 4.25 | 0.008 |
| % receiving at least one college credit—AP only | 5.93 (18.41) | 8.53 (27.94) | -2.60 | 1.94 | 0.186 |
| % receiving at least one college credit—both AP and dual enrollment | 2.92 (18.06) | 1.08 (10.34) | 1.84 | 0.71 | 0.013 |
| # college credits earned | 3.96 (9.09) | 2.21 (6.09) | 1.75 | 0.45 | 0.000 |
| # college credits earned—dual enrollment only | 3.23 (8.83) | 1.35 (4.82) | 1.88 | 0.51 | 0.001 |
| # college credits earned —AP only | 0.72 (1.86) | 0.87 (3.85) | -0.14 | 0.24 | 0.549 |

Note. A careful reader may wonder why the % enrolled in dual enrollment courses only is lower than the % receiving at least one college credit only through dual enrollment. This is because individuals who are receiving credit only through dual enrollment may also have been simultaneously enrolled in AP courses (and thus show up in the percentage of students enrolled in both AP and dual enrollment courses) but did not receive credit from those AP courses; for that reason, they would then be included in the % receiving credit only from dual enrollment courses, even though they were enrolled in AP courses.

*Table E-5. Impacts for Economically Disadvantaged Students, Michigan*

| Outcome | Treatment (N=2,462) Adjusted Mean (SD) | Comparison (N=9,478) Unadjusted Mean (SD) | Adjusted Impact Estimate at Year 4 | Impact Estimate Standard Error | p-value |
|---|---|---|---|---|---|
| % enrolled in any college course | 35.51 (46.17) | 28.14 (44.97) | 7.37 | 5.23 | 0.165 |
| % 11th enrolled in dual enrollment courses only | 17.78 (32.67) | 5.77 (23.32) | 12.01 | 3.43 | 0.001 |
| % enrolled in AP courses only | 12.76 (34.12) | 20.01 (40.01) | -7.25 | 5.04 | 0.157 |
| % enrolled in both AP and dual enrollment courses | 5.04 (22.21) | 2.35 (15.16) | 2.69 | 1.29 | 0.044 |
| % receiving at least one college credit | 20.69 (37.62) | 10.17 (30.23) | 10.52 | 2.95 | 0.001 |
| % receiving at least one college credit—dual enrollment only | 18.42 (35.66) | 7.28 (25.98) | 11.14 | 2.97 | 0.000 |
| % receiving at least one college credit—AP only | 1.14 (10.97) | 2.54 (15.74) | -1.40 | 1.03 | 0.180 |
| % receiving at least one college credit—both AP and dual enrollment | 1.09 (9.41) | 0.35 (5.89) | 0.74 | 0.45 | 0.102 |
| # college credits earned | 2.30 (6.17) | 0.95 (3.99) | -1.35 | 0.30 | 0.000 |
| # college credits earned—dual enrollment only | 2.16 (6.05) | 0.73 (3.52) | -1.43 | 0.32 | 0.000 |
| # college credits earned —AP only | 0.14 (0.82) | 0.21 (1.86) | 0.07 | 0.10 | 0.488 |

Note. A careful reader may wonder why the % enrolled in dual enrollment courses only is lower than the % receiving at least one college credit only through dual enrollment. This is because individuals who are receiving credit only through dual enrollment may also have been simultaneously enrolled in AP courses (and thus show up in the percentage of students enrolled in both AP and dual enrollment courses) but did not receive credit from those AP courses; for that reason, they would then be included in the % receiving credit only from dual enrollment courses, even though they were enrolled in AP courses.

*Table E-6. Impacts for Non-Economically Disadvantaged Students, Michigan*

| Outcome | Treatment (N=2,768) Adjusted Mean (SD) | Comparison (N=11,385) Unadjusted Mean (SD) | Adjusted Impact Estimate at Year 4 | Impact Estimate Standard Error | p-value |
|---|---|---|---|---|---|
| % enrolled in any college course | 51.99 (49.92) | 45.30 (49.78) | 6.69 | 5.15 | 0.200 |
| % 11th enrolled in dual enrollment courses only | 21.14 (38.48) | 8.84 (28.38) | 12.30 | 5.30 | 0.025 |
| % enrolled in AP courses only | 21.08 (40.63) | 31.07 (46.28) | -9.99 | 6.14 | 0.111 |
| % enrolled in both AP and dual enrollment courses | 9.95 (34.72) | 5.39 (22.59) | 4.56 | 2.61 | 0.087 |
| % receiving at least one college credit | 36.17 (47.70) | 23.56 (42.44) | 12.61 | 3.77 | 0.002 |
| % receiving at least one college credit—dual enrollment only | 25.53 (44.43) | 12.20 (32.73) | 13.33 | 4.72 | 0.007 |
| % receiving at least one college credit—AP only | 7.30 (19.71) | 9.97 (29.96) | -2.66 | 2.11 | 0.213 |
| % receiving at least one college credit—both AP and dual enrollment | 3.38 (19.28) | 1.39 (11.70) | 2.00 | 0.85 | 0.024 |
| # college credits earned | 4.36 (9.33) | 2.42 (6.40) | 1.94 | 0.54 | 0.001 |
| # college credits earned—dual enrollment only | 3.42 (9.05) | 1.42 (5.05) | 2.01 | 0.63 | 0.002 |
| # college credits earned —AP only | 0.92 (2.04) | 1.01 (4.10) | -0.08 | 0.25 | 0.732 |