

# Research Synthesis: Innovation Pathways

## Results From the Massachusetts Innovation Pathways Resource Allocation and Expansion Feasibility Study

### MAY 2023

The Massachusetts Innovation Pathways Resource Allocation and Expansion and Feasibility Study was funded by the Massachusetts Department of Elementary and Secondary Education (DESE) to inform efforts to expand access to Innovation Pathway (IP) programs across the Commonwealth. Experts at the American Institutes for Research<sup>®</sup> (AIR<sup>®</sup>) set out to understand the cost components and funding mechanisms that can support or hinder the expansion of these programs.

The study was designed to inform three overall research topics:

- **Program typology.** How can IP programs be categorized to examine costs and funding?
- **Program costs and funding.** What are the costs and funding mechanisms for current IP programs?
- **Program implementation and scaling.** What cost and funding factors may influence the expansion of IP programs?

AIR supplemented existing program data about program costs by conducting interviews with a sample of representative IP programs and administered program surveys to all current IP programs to better understand program cost.

### IP Program Typology

Massachusetts IP programs share a common purpose and goals, though programs vary in their design. The first component of the study was to create a typology to determine if and how these programs could be grouped to estimate costs with more efficiency. In partnership with DESE, AIR identified key design components of IP programs that vary and thus could impact resource allocation. Examples of these program components include program maturity, program size, number of pathways offered, culminating experience, and credentials offered. The design components informed the development of a program typology used in the analysis and reporting of study findings.

#### IP Typology for Cost Analysis

**Mature programs with large IP program enrollment and many industry pathways (eight programs):** More years in operation, relatively large IP program enrollment, offer more industry pathways, more likely to offer both capstone and internship as culminating experience, more likely to offer industry-recognized credential, more likely to offer Early College, gain additional industry pathways after first year, serve relatively larger high schools.

**Mature programs with medium IP program enrollment and few industry pathways (13 programs):** More years in operation, relatively moderate IP program enrollment, offer few industry pathways, less likely to offer both capstone and internship as culminating experience, less likely to offer industry-recognized credential, more likely to offer non-Chapter 74 program, do not offer Business and Finance pathway, less likely to offer Early College, serve relatively small high schools.

**New programs with small IP program enrollment and few industry pathways (20 programs):** Few years in operation, relatively small IP program enrollment, offer few industry pathways, less likely to offer both capstone and internship as culminating experience, more likely to offer industry-recognized credential, more likely to offer Early College, serve relatively larger high schools.

### Program Costs and Funding

The second component of the study focused on determining the resources allocated to six cost categories (administration, instruction, academic advising, nonacademic advising, college and career advising, and outreach and recruitment) and how programs are currently covering said costs.

### Total Cost

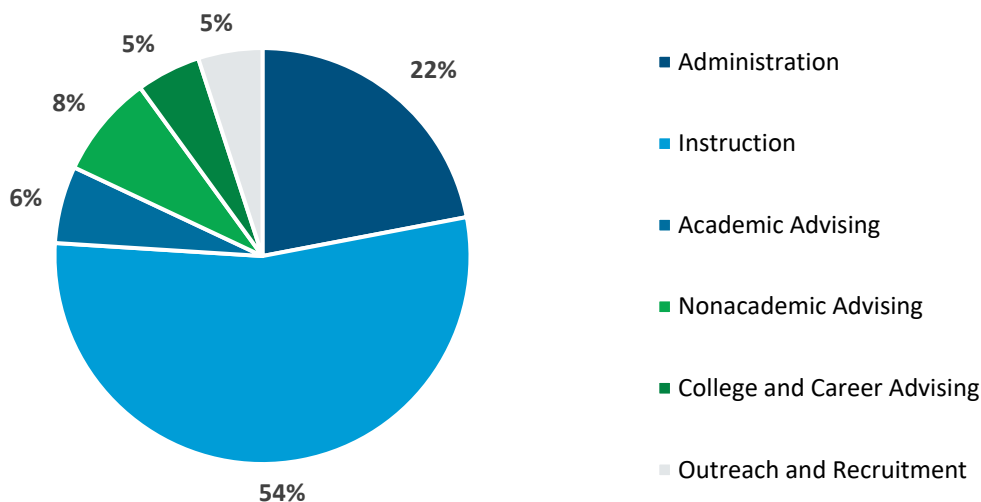
Overall, across programs, the average cost per student served by an IP program during the 2021–22 school year was \$5,139 with significant differences across number of years programs have been designated and have been implementing programs (Exhibit 1). Note that this figure represents the *additional cost* of providing an IP program, on top of business-as-usual instruction and school operations.

Exhibit 1. Average Costs per Student

Cost category	Years designated			All programs (n=16)
	Year 1 (n=4)	Year 2 (n=3)	Year 3 (n=9)	
Administration	\$5,383	\$3,006	\$481	\$1,124
Instruction	\$4,636	\$4,393	\$2,377	\$2,759
Academic advising	\$951	\$302	\$278	\$334
Nonacademic advising	\$1,395	\$356	\$339	\$424
College and career advising	\$807	\$248	\$188	\$243
Outreach and recruitment	\$697	\$337	\$202	\$255
<b>Total</b>	<b>\$13,870</b>	<b>\$8,642</b>	<b>\$3,864</b>	<b>\$5,139</b>

Instruction was the most expensive cost component of IP programs (54% of the total cost), followed by administration costs (22%), which together accounted for three quarters of IP program costs. The remaining cost categories, which included nonacademic advising (8%), academic advising (6%), college and career advising (5%), and outreach and recruitment (5%), were relatively lower, each accounting for less than 10% of the per student cost (Exhibit 2).

Exhibit 2. Proportional Average Costs per Student by Cost Category



### Costs by IP Program Type

New programs with small IP program enrollment and few industry pathways had a significantly higher average cost per student. More mature programs (Type A and B) spend less per student, with the largest reduction in administration costs, followed by instruction costs for Type A programs. Differences in costs between program types could be due to high startup costs for new programs and the development of economies of scale as programs mature.

**Exhibit 3. Average Costs per Student by IP Type**

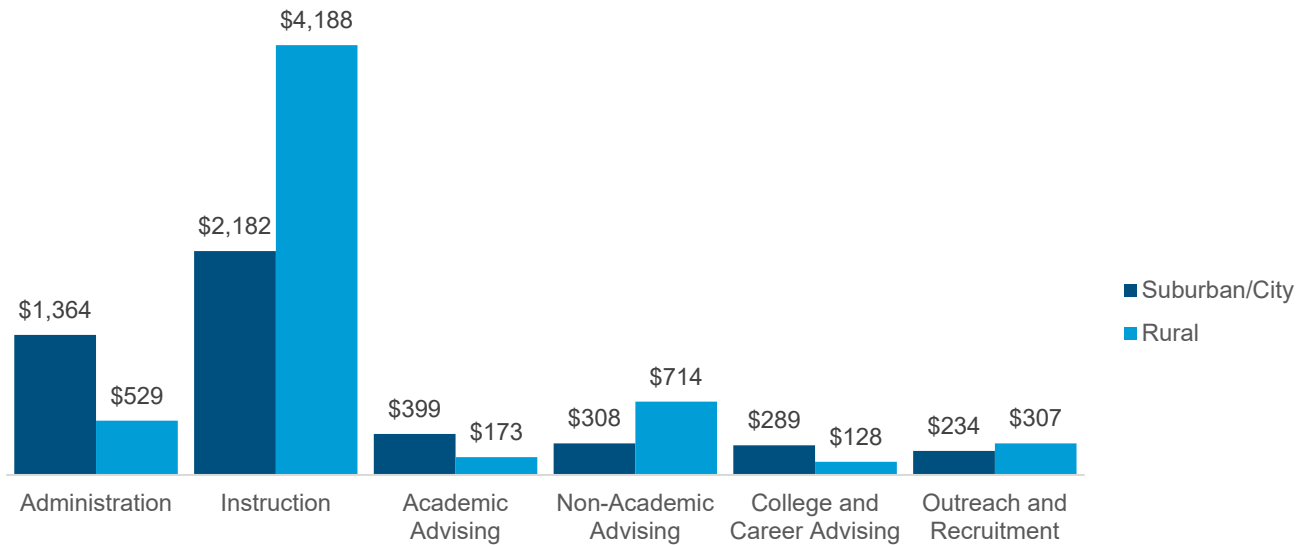
Cost category	IP type		
	Type A Mature programs with large IP program enrollment and many industries pathways (n=3)	Type B Mature programs with medium IP program enrollment and few Industry pathways (n=6)	Type C New programs with small IP program enrollment and few industry pathways (n=7)
Administration	\$462	\$515	\$4,059
Instruction	\$1,373	\$4,202	\$4,501
Academic advising	\$193	\$431	\$589
Nonacademic advising	\$420	\$190	\$816
College and career advising	\$189	\$185	\$496
Outreach and recruitment	\$187	\$230	\$497
<b>Total</b>	<b>\$2,824</b>	<b>\$5,753</b>	<b>\$10,958</b>

### Costs by Locale<sup>1</sup>

Overall, the costs per student in suburban areas or cities is \$4,776, while the costs in rural areas are significantly higher, at \$6,038 per student (Exhibit 4). When examining the cost per student within each of the six cost categories, the results show stark differences. Differences in costs between suburban or city and rural IP programs highlight what could be unique challenges faced by rural programs, particularly when it comes to the cost of instruction and nonacademic advising. However, differences may be due to program size, as rural programs are smaller, on average.

<sup>1</sup> The locale was determined by the National Center for Education Statistics locale classifications.

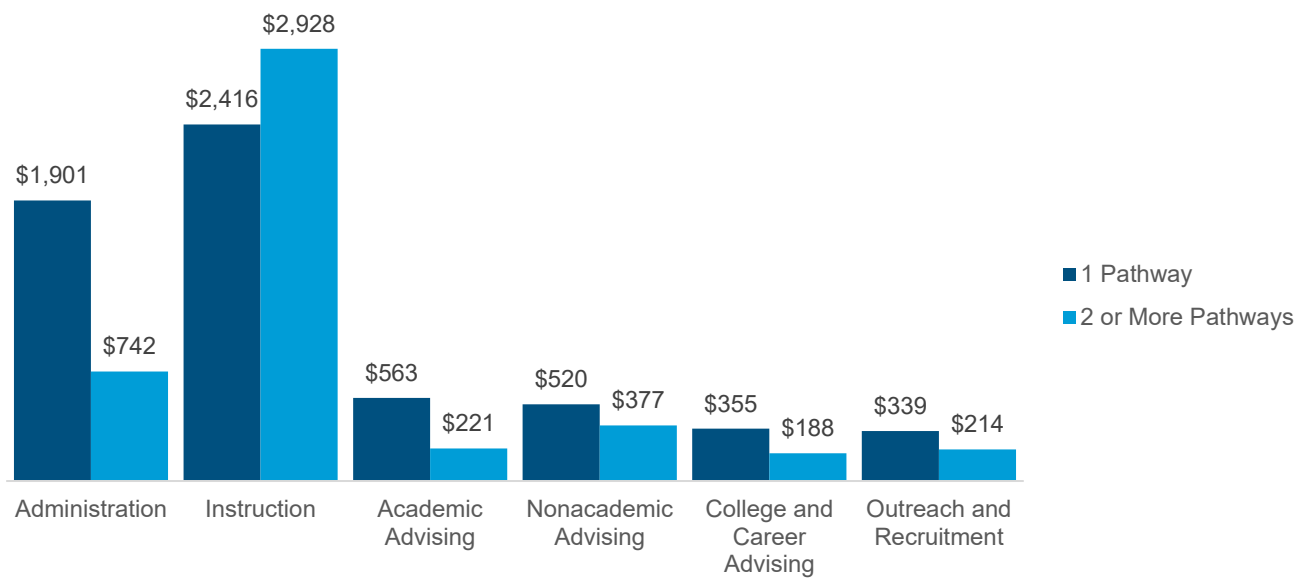
**Exhibit 4. Average Costs per Student by Cost Category and Locale**



**Costs by Number of Pathways**

Overall, the costs per student for programs offering one pathway are \$6,093, while the cost for programs offering two or more pathways is \$4,670 per student. Programs that offer one pathway incur higher costs in all cost categories except for instruction (Exhibit 5).

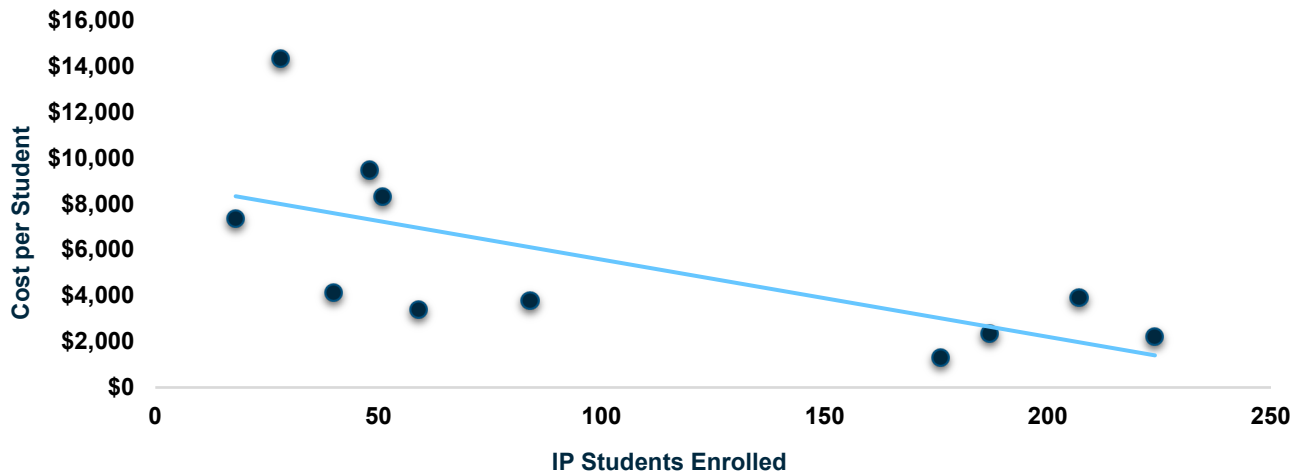
**Exhibit 5. Average Costs per Student by Cost Category and Number of Pathways**



## Costs and Student Enrollment

The trend observed in the data suggests that as the program size increases, the cost per student decreases (Exhibit 6). The downward slope of the fitted line indicates that for every additional IP student enrolled, the cost per student decreases by approximately \$34. These findings suggest that larger programs may have access to economies of scale, decreasing the cost per student as the program grows.

**Exhibit 6. Cost per Student and Number of Students Enrolled**

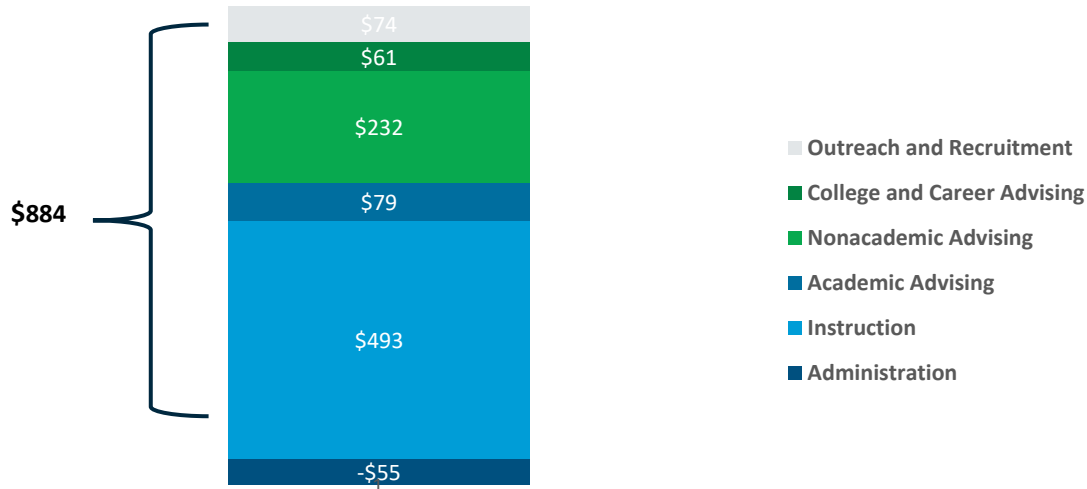


Note: Programs with fewer than 15 students are removed from the figure to ease interpretation and protect privacy. Removing those programs does not alter the broad interpretation of the graph.

## Average Marginal Cost

Exhibit 7 provides a detailed look at the costs associated with each additional student enrolled in IP programs and highlights the impact of each student on the overall cost structure. The average cost per student is \$5,139, and the average marginal cost of the next student is \$884. The majority of this marginal cost is attributed to instruction, which is a variable cost that increases with the addition of each student. With \$493 of the \$884 being driven by instruction, it highlights the fact that educational costs are the most significant driver of cost in IP programs. The marginal cost of administration is negative, which contradicts theory. This suggests that the cost category does not have a strong relationship with enrollment, and it should be viewed as more of a fixed cost at the current scale of operations.

## Exhibit 7. Average Marginal Cost per Student by Cost Category<sup>i</sup>



### Program Implementation and Scaling

The third component of the study focused on identifying cost factors that may inform or influence plans for the expansion of IP programs. Respondents cited the primary cost factor impacting implementation and expansion plans was **staffing**; especially as it relates to having adequate staffing to better serve priority student groups (e.g., English learners, students with disabilities), provide robust student supports aligned to specific IP student needs, develop industry relationships and connections to expand programming, and manage student internship and capstone projects to ensure high-quality experiences. Respondents also identified the cost of necessary **pathway-specific materials** as part of instruction as a key cost factor. Programs need to purchase and maintain equipment (e.g., computers, lasers) as well as consumables (e.g., lab supplies). While some equipment costs are higher at program startup, as programs expand, equipment must be maintained and/or updated. Finally, respondents highlighted **student transportation** costs as another key cost factor impacting expansion as programs coordinate how to get students to their internship experiences safely.

<sup>i</sup> Examples of costs from each category: Administration (developing class schedules, managing relationships with partners, compiling and reporting IP-relevant data); Instruction (staff salaries, program equipment, professional development); Academic Advising (tutoring, embedded classroom student advocate); Nonacademic advising (success seminars, check-in meetings, parent/family night); College and Career Advising (career fairs, FAFSA workshop); Recruitment and Outreach (developing informational materials, hosting open house/information sessions).