

Fostering Massachusetts Data Science Transfer Pathways from Associate’s to Bachelor’s Programs*

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Overview

This document provides an extended introduction and background orientation for the June 13, 2022 [Massachusetts Two-Year College Data Science Symposium](#). The full whitepaper (recommended reading) can be found at: <https://dsc-wav.github.io/facdev22/pathways/pathways.pdf>.

Data Science at Community Colleges

Two-year (community) colleges play a critical role in higher education in the United States. [Blumenstyk \(2021\)](#) describes two-year colleges as “the keystone for the nation’s plan to help more people earn a postsecondary credential.” A large fraction of students who complete their college education at a public university in the United States begin their journey at a two-year college. While the number of four-year colleges offering bachelor’s degrees in data science continues to increase, data science instruction at many two-year colleges lags behind.

At the same time—and by all accounts—job prospects in data science are excellent due to high salaries, expansive job growth, and comfortable working conditions. According to Glassdoor, data scientist is [the #2 job in America for 2021](#), and has ranked among the top three every year since 2016. The US Bureau of Labor Statistics reports [a mean annual wage of \\$103,930](#) for data scientists, and estimates that jobs will grow [22% for Computer and Information Research Scientists](#) and [33% percent for Mathematicians and Statisticians](#) over the next ten years.

There is a pressing need to grow the workforce in these areas. A systemic approach is needed with investments from the government and private industry.

Providing equitable access to these desirable jobs is a challenge that intersects with larger issues of class and income inequality in the United States. The Massachusetts Department of Higher Education has identified equity as a major priority for future work (see <https://www.mass.edu/strategic/equity.asp>). Recent reports (e.g., “Keep Data Science Broad” [Rawlings, et al. \(2018\)](#) and “Data Science for Undergraduates” [National Academy of Sciences, Engineering, and Medicine \(2018\)](#)) recognize this challenge and call for tighter partnerships between two- and four-year colleges. If the field of data science is serious about diversifying its workforce, then there must be paths to high-paying jobs in data science that begin at two-year colleges.

At the December 2018 meeting of the National Academies Postsecondary Data Science Education Roundtable, D.J. Patil, former Chief Data Scientist in the White House Office of Science and Technology Policy, described how his experience from a two-year college bestowed upon him “three gifts”: “a love of mathematics, an understanding of how to write in various genres, and confidence to succeed at the postsecondary level ([Roundtable](#)

*More information about the Massachusetts Data Science Pathways project can be found at <https://dsc-wav.github.io/ma-ds-pathways>.

[report, pg. 158](#)). He expressed that his experience at community college provided a crucial “on-ramp” to his future success in data science.

Like Patil, we see community colleges as key players in developing the next generation of data science students. Our experience with the NSF-funded [DSC-WAV project](#) and other interactions have shown that our community college system has countless committed and engaged educators and administrators working to build better futures for their students amidst time and resource constraints.

Our Goal

Our goal is to identify pathways and opportunities to foster smooth transitions from an associate’s degree to a bachelor’s degree in data science from the perspective of a Massachusetts student. While we focus on the fifteen community colleges in Massachusetts since we know that system best, many of the challenges we faced in the Commonwealth are applicable across the nation.

Our Plan

We have identified key courses that would be needed to support a robust data science associate’s degree program that would allow a student to transfer to a four-year institution (or enter directly into the workforce).

Five points of curricular friction merit particular attention:

1. A first course in data science (Data Science I)
2. A second course in data science (Data Science II)
3. A course in scientific computing, data science workflow, and/or reproducible computing
4. Lab sciences
5. Navigating communication, ethics, and application domain requirements in the context of general education and liberal arts course mappings

The most immediate impediment is the relative paucity of introductory data science courses that serve multiple student audiences and can easily transfer. It is not possible to imagine a sensible transfer pathway in which students are not exposed to the key ideas in data science until their junior year. Irrespective of pathways to degrees, it is critically important that community college students have the opportunity to develop these skills.

In order for data science transfer pathways to work, community colleges *must* offer a first course in data science.

In addition, the lack of predefined transfer pathways (or articulation agreements) for data science creates a growing disconnect that leaves students who want to study data science at a disadvantage. A number of barriers and challenges exist that complicate transfer pathways. The Symposium is intended to identify challenges and suggest ways to move forward.

More details of the points of friction and the current landscape in Massachusetts and nationally can be found in [the full whitepaper](#).

Closing Thoughts

At the June 2019 NASEM Roundtable meeting (which focused on two-year colleges), Uri Treisman of the University of Texas-Austin described data science programs as “powerful resources for students seeking upward mobility ([Roundtable report, pg. 165](#)).”

We agree that community colleges are the only affordable game in town and serve a key role in data science education now and in the future. We look forward to the discussions at the Symposium and the follow-on conversations and next steps that will take place at the [Faculty Development workshop](#) to follow.