

Data Skills Pathways for Undergraduates to go from Curricula to Internship to Employment

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Topic Section - From Wonder to Workforce: Integrating Play, Passion, and Purpose in STEM Career Pathways

Abstract

Undergraduate students are increasingly expected to enter internships and the workforce with skills in programming, data processing, quality control, analysis, documentation, and scientific communication. Yet many students encounter these skills only through small, pre-cleaned datasets or late-stage capstone projects. Moreover, access to authentic experiential learning opportunities and research experiences often depends on informal faculty connections, prior technical experience, or a student's ability to accept unpaid work. These barriers can be particularly significant for first-generation and Pell-eligible students.

The University of North Dakota (UND) Data Skills Pathway addresses this gap through a structured, credit-bearing program that connects undergraduate coursework to authentic experiential learning opportunities, paid research positions, and internships. Anchored in data science and open to students from multiple disciplines, the program has already attracted seven students from atmospheric sciences, aviation, engineering, physics, and chemistry during the first six months of a funded four-year project. Students progress through four connected pillars: (1) orientation to data-intensive careers; (2) programming through complex analysis; (3) guided-to-independent collection, documentation, and visualization tasks; and (4) simple-to-complex tasks involving observational and model datasets. The Pathway includes a capstone mini-project consisting of a written report and presentation. Emphasis is placed on data provenance, reproducible workflows, analytical judgment, uncertainty, and clear communication rather than mere code development.

Beyond purpose, sustained success in data-intensive careers requires passion. The Pathway sparks it through an ever-expanding list of opportunities that connect students' interests to careers, which currently includes working with data from meteorological instruments, field platforms, research aircraft, uncrewed aircraft systems, numerical weather models, and computational fluid dynamics simulations. Students are encouraged to begin by playing with data to get familiar with a topic they care about.

Students who successfully complete the Data Skills Pathway receive priority consideration for paid research assistantships and internships with university research groups and external partners. UND's Experiential Learning Center supports recruitment, advising, placement, and follow-up, helping broaden access to structured research opportunities. The project evaluates student participation, completion, skill development, career awareness, research products, and transitions into paid work-based learning. Over four years, approximately 80–100 students are expected to complete the Pathway program. The broader goal is to create a sustainable, adaptable model that transforms fragmented undergraduate research experiences into a coherent pathway linking curriculum to workforce participation.