South Dakota Science and Technology Plan 2030

SD EPSCoR
RESEARCH. EDUCATION. ECONOMIC DEVELOPMENT.

RTI INTERNATIONAL

The development of the South Dakota Science & Technology Plan 2030 was led by Jennifer Ozawa at RTI International in collaboration with the South Dakota EPSCoR Research Excellence: A Critical Hallmark Committee. Barbara Giles, PhD, Sherry Mills, MPH, MD, Jeff Rosen, PhD, and Ivy Estabrooke, PhD served as senior advisors. Shannon Wells, Tiger Fawaz, Adams Bailey, Jessica Wilkinson, and Alison Bean de Hernandez of RTI supported research, data collection, and analysis. Lisa Gardner created the report design, and Christina Rodriguez was the editor. The plan was adopted by the South Dakota EPSCoR REACH Committee on March 11, 2025.

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April 1, 2025

A Message from the Chair

The South Dakota EPSCoR Research Excellence: A Critical Hallmark (REACH) Committee updated the Science and Technology Plan for the State of South Dakota over the past 12 months. This plan guides the selection of the National Science Foundation EPSCoR E-CORE and E-RISE proposals, as well as state initiatives including Research Centers and Board of Regents research programs. The South Dakota Science and Technology Plan, published in April 2025, is the result of this effort.

The goal of The South Dakota Science and Technology Plan is to build science and technology capacity in South Dakota by promoting innovation, fostering knowledge-based companies, generating higher wage science, technology, engineering, and math (STEM) jobs, and building the capacity to sustain the prosperity these companies create. The SD EPSCoR Advisory Committee (the REACH Committee) developed the South Dakota Science and Technology Plan to address this challenge. The strategic plan is, at its core, a collaborative venture between the state's public and private sectors to build the capacity to produce and increase the generation of new ideas, talent, and companies that will power South Dakota's future innovation-rich, higher-value economy.

The initiatives proposed will help South Dakota build the solid base of science, technology, engineering, and math knowledge and know-how needed to support and expand target industry sectors over the next several decades.

Sincerely,

Darren Haar
Chair, South Dakota EPSCoR REACH Committee

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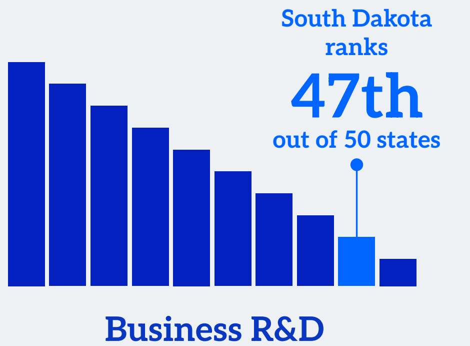
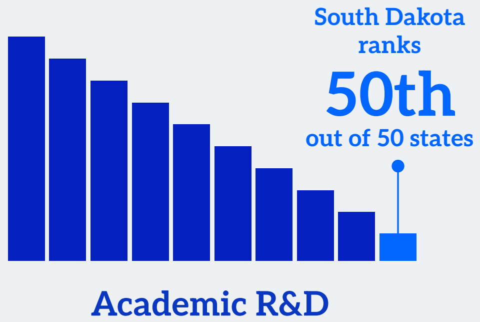
The Business Case for Greater Investment

The *South Dakota Science & Technology Plan 2030* calls for South Dakota to invest in research and commercialization to drive economic growth and diversification and to educate a highly prepared science, technology, engineering, and mathematics (STEM) workforce.

The data are stark. Today, South Dakota ranks 47th for business R&D and 50th for academic R&D out of 50 states. These rankings suggest that South Dakota has fewer advanced manufacturing, information technology (IT) and cybersecurity, and life sciences companies, less academic research and tech transfer activity, and fewer STEM graduates each year compared to other states.





Although South Dakota's rankings have fallen over the past 10 to 15 years, neighboring states like Wyoming and North Dakota have moved up the rankings due to sizeable state investments in research, commercialization, and STEM education. South Dakota has made significant similar investments in the past.

Why do these rankings matter? U.S. and South Dakota economic and labor department forecasts indicate that companies in high-tech services and advanced manufacturing industries—and the STEM jobs these companies and industries create—are most likely to generate the strongest growth over the next 10 years. The median salary of a STEM job is $101,650 compared to a median salary of a non-STEM job, which is $46,680.[1] In South Dakota, STEM jobs are projected to grow by 1.3% per year by 2032, compared to an average annual growth of 0.7% in non-STEM jobs.[2]

Without STEM-educated workers, high-tech and advance manufacturing companies cannot expand in South Dakota. Without these companies and job opportunities, South Dakota students pursuing STEM degrees will look for jobs in other states.

1 U.S. Bureau of Labor Statistics (2024). Employment Projections.
2 South Dakota Department of Labor and Regulation (2024). Employment Projections by Occupation.

The Strategy

Vision

South Dakota invests in research and commercialization to drive economic growth and diversification and to educate a highly prepared STEM workforce.

Mission

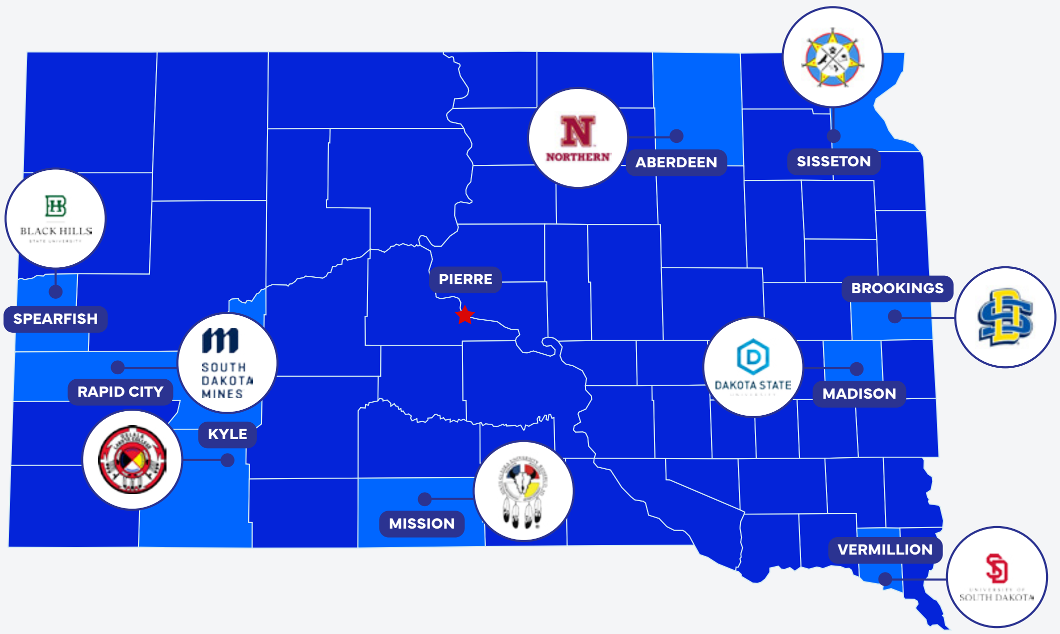
Invest in developing research and commercialization activity and the technical and business skills that will enable the next generation of South Dakotans and students educated in South Dakota to build their careers and to launch and expand science- and technology-driven companies in the state.

Strategy

The strategy consists of five key initiatives:

1. Advance technology commercialization and the growth of innovation-based companies in South Dakota.
2. Increase research and commercialization activity at higher education institutions by improving system-level operational effectiveness.
3. Develop a South Dakota "grow our own" STEM talent initiative to expand the workforce pipeline.
4. Launch a 10-year $50 million state initiative to invest in university-industry research commercialization, faculty, and the STEM talent pipeline.
5. Develop a plan to leverage federal investment to build public-private research and commercialization partnerships in high-priority opportunity areas:
    - cybersecurity and data analytics
    - deep underground science and engineering
    - bioprocessing and precision agriculture
    - clinical research, health care, and computational science
    - critical minerals, environmental science, and water

Figure ES-1. South Dakota Six State Universities and Three Tribal Colleges



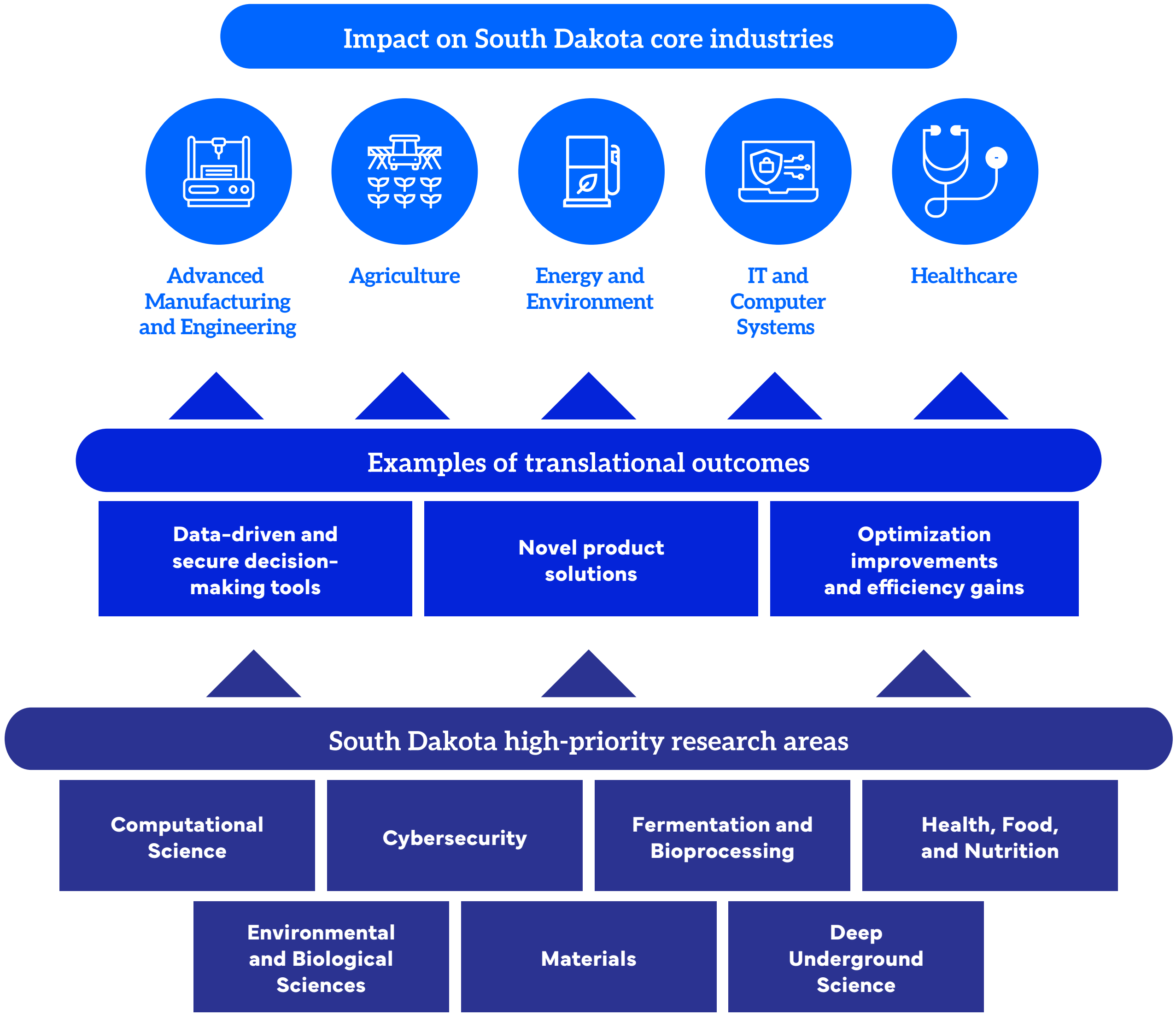
Governance

The plan will require the leadership and coordination of: (1) the state, via the Governor's Office of Economic Development, (2) the industry-led South Dakota EPSCoR REACH Committee, and (3) the vice presidents of research and research administrators of South Dakota's six public universities and three tribal colleges.

High-Priority Research Areas

To focus the plan, high-priority research areas were identified that build on South Dakota's existing business and academic research strengths and leverage federal and private sector investment priorities. Expanding research activity in these areas will drive integrated and translational outcomes that increase the competitiveness of South Dakota's key industries and advance South Dakota's R&D leadership position nationally and globally.

Figure ES-2. South Dakota High-Priority Research Areas, Examples of Translational Outcomes, and Impact on South Dakota Core Industries



The Impact

The execution of plan initiatives through 2030 will catalyze the following anticipated impacts by 2035, as shown in the figure below.

Operational Effectiveness

- Reinvest dollars from existing programs to support R&D growth
- Invest in commercialization and entrepreneurship support programs
- Standardize intellectual property and sponsored research templates

Key Metrics

- # of faculty receiving federal grants for the first time
- # of invention disclosures
- # of licenses executed
- # of companies sponsoring research

Impact Areas		Now 2023	Future 2035
1 Research and Commercialization	Business R&D expenditures	$201M	$350M
	Academic R&D expenditures	$129M	$250M
	Industry-sponsored academic R&D	$2.5M	$7.5M
	Licenses executed	2	10
2 High-Tech Companies	High-tech employment	18,558	28,000
	3-year average SBIR/STTR awards	6	18
	3-year average SBIR/STTR value	$3M	$9M
	5-year total VC deal flow	38	65
	5-year VC Investment	$57M	$125M
3 STEM Talent	Associate STEM degrees	717	950
	Bachelor's STEM degrees	2,963	3,750
	Master's STEM degrees	855	1,425
	PhD STEM degrees	116	215

Note: STEM degrees includes all science and engineering and health sciences degrees. The 3-year averages calculated for SBIR and STTR awards are for 2021-2023 and 2033-2035. The 5-year totals calculated for VC deal flow and investment are for 2019-2023 and 2031-2035. Nondisclosure of VC deal size may cause these values to be understated.

About This Plan

Purpose

The South Dakota Science & Technology Plan 2030 (hereafter, the S&T Plan) presents a stakeholder- and data-driven vision and strategy for the roles that the research, commercialization, and science, technology, engineering, and mathematics (STEM) workforce can play in advancing South Dakota's economic diversification and growth.

The plan sets a strategic direction for concerted action and coordination among industry, higher education, and government stakeholders to advance high-priority goals. It is informed by South Dakota's economic development priorities and analysis of South Dakota's current competitive positioning nationally and vis-à-vis other states in four areas: Research Competitiveness, Commercialization and Innovation, STEM Workforce, and High-Tech Industry.

This 5-year plan satisfies a requirement of the National Science Foundation's Established Program to Stimulate Competitive Research (EPSCoR) programs, specifically EPSCoR Collaborations for Optimizing Research Ecosystems Research Infrastructure Improvement (E-CORE RII) and EPSCoR Research Incubators for STEM Excellence Research Infrastructure Improvement (E-RISE RII). It also provides recommendations on highest-impact state investments for expanding institutional research programs.

Photo credit: South Dakota EPSCoR

Approach

The South Dakota Research Excellence: A Critical Hallmark Committee (hereafter, REACH Committee) is the statewide jurisdictional committee and governing body providing oversight and coordination of South Dakota's EPSCoR initiatives. It comprises leaders from South Dakota research- and technology-intensive companies, as well as higher education institutions, including the state's six public Board of Regents universities and three Tribal colleges. Through a competitive bid process, the South Dakota REACH Committee engaged RTI International to facilitate the development of this strategic plan. The RTI team included subject matter experts who are former federal research funding agency program directors.

Institutional Research Strategies

In the first half of this 12-month project, RTI collected and analyzed South Dakota higher education institution proposal and award data from the past 5 years. The goal of this analysis was to identify trends and patterns in federally supported research activity. The RTI team then conducted interviews with university administrators and faculty at Oglala Lakota College and the state's six public universities to assess strengths and weaknesses for expanding research from the perspective of stakeholders. RTI used the quantitative and qualitative analysis to generate a strength, weaknesses, opportunities, and threats analysis and to make recommendations for improving federally supported research activity. High-level results were presented at the annual South Dakota Research Symposium in July 2024.

State Strategy

In the second half of the project, RTI analyzed a variety of industry output and employment, business, and academic research expenditures, technology transfer, risk capital investment, and STEM degree production data to benchmark South Dakota's competitive positioning against other states and the national average over the past 5- and 10-year intervals. RTI then conducted nearly 120 interviews with representatives of science- and technology-intensive companies, venture capital investors, state and regional economic development organizations, and university research, technology transfer, and industry engagement administrators to assess key strengths and weaknesses for increasing South Dakota economic competitiveness in research- and technology-intensive business activity. To develop the final strategic plan, RTI drew upon the bottom-up institutional research strategies from phase 1 of this project and the state-level economic and innovation competitiveness analysis and goals developed in phase 2.

Report Organization

The first section of this report presents the business case for why South Dakota should invest in more research and commercialization activity, as well as the stakeholder vision for the role that science and technology can play in advancing industry sectors that will create higher-wage job opportunities. It includes competitive analysis and benchmarking of South Dakota. The second section presents the strategic plan, including goals and key initiatives, and the plan's intended impact, if executed. The appendix provides detailed time-series data and benchmarks for each of the indicators used in the body of the report.

The Business Case for Greater Investment

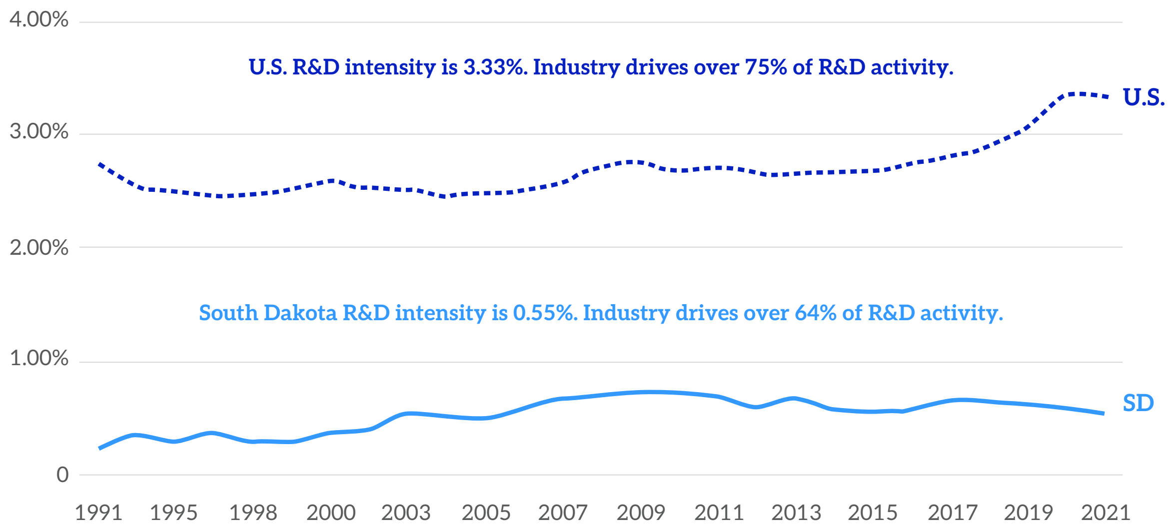
The S&T Plan calls for South Dakota to invest in research and commercialization to drive economic growth and diversification while educating a highly prepared STEM workforce to fuel economic expansion.

What is research and commercialization?

Research and commercialization are activities that drive new scientific discoveries, new technologies, and new products and services that power company growth. Around the globe, higher R&D intensities (R&D expenditures as a share of gross domestic product [GDP]) are correlated with stronger economic outcomes.

Industrialized countries, such as Organisation for Economic Co-operation and Development member countries from North America, Europe, East Asia, Australia, and New Zealand, have an average R&D intensity of 2.73% of their respective GDPs. At 3.33%, the United States's R&D intensity is even higher, while South Dakota's R&D intensity is 0.55%.

Figure 1. South Dakota and U.S. R&D Intensity, 1991-2021



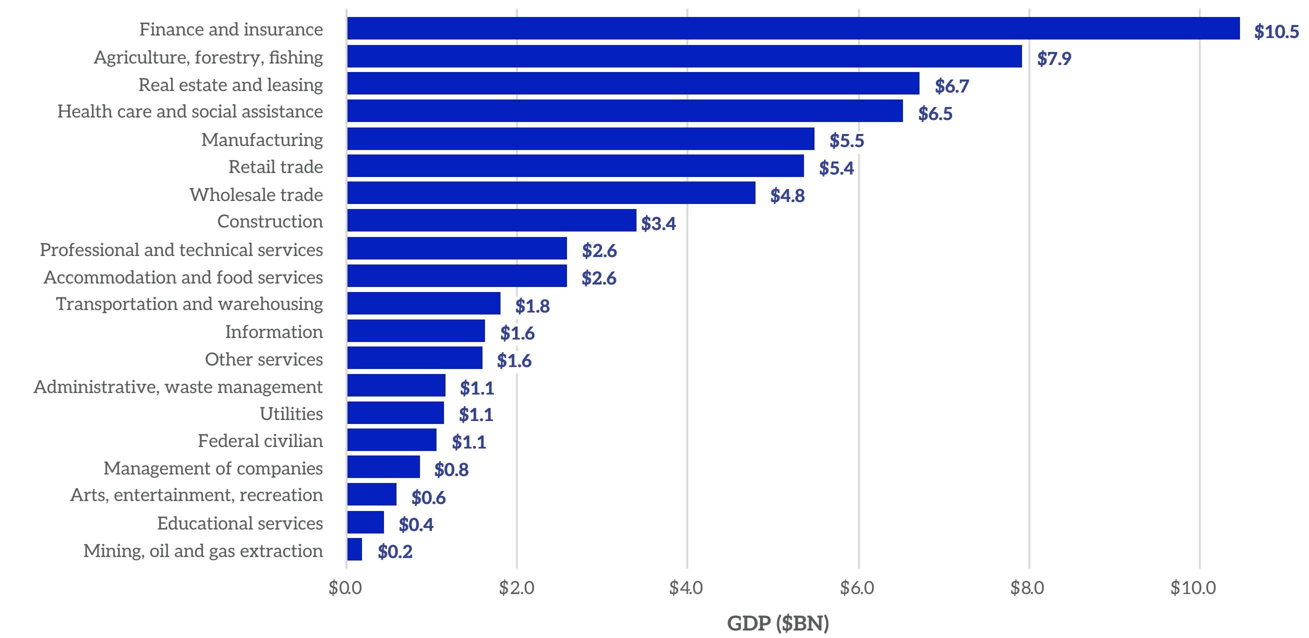
Source: National Center for Science and Engineering Statistics, National Patterns of R&D Resources (various years).

South Dakota needs stronger growth in its science- and technology-driven industries.

South Dakota's $72 billion economy is highly concentrated in finance, agriculture, and real estate, as measured by GDP. Of South Dakota's top three industries by GDP, only one—finance, at sixth—ranks in the top 10 for employment. One of the reasons for the lower employment in the leading industries by GDP is their relatively high capital- and technology-intensity.

South Dakota needs stronger growth in advanced manufacturing and professional and technical services to provide a more diversified economy for long-term growth and higher-wage jobs.

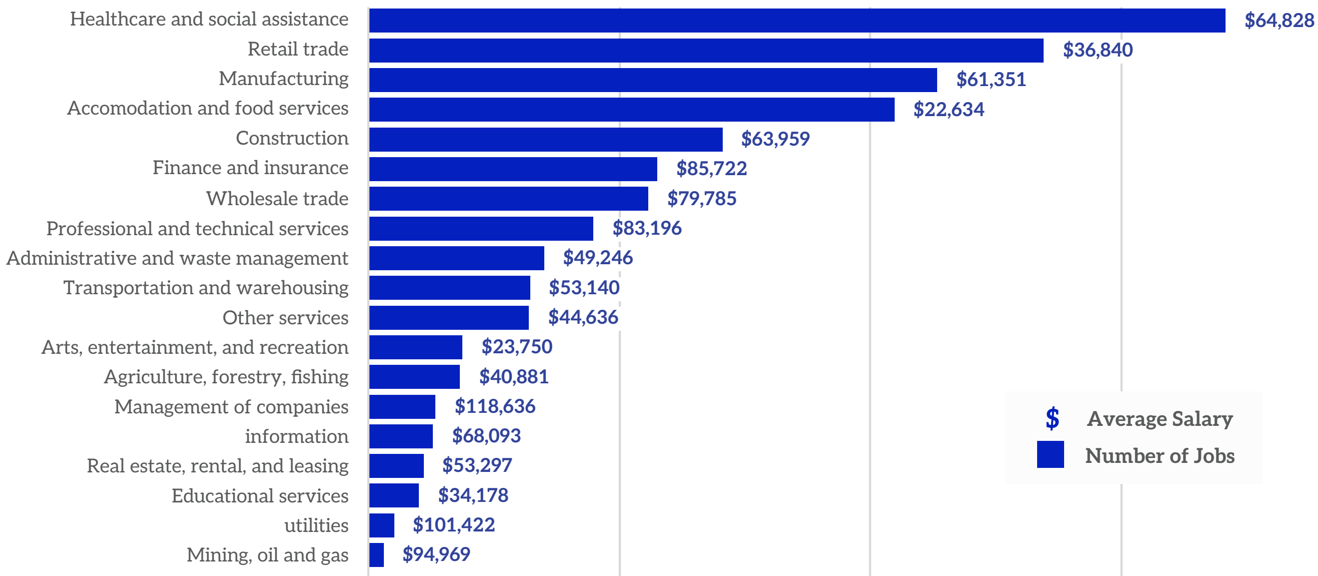
Figure 2. South Dakota GDP by Industry ($BN), 2023



Source: U.S. Bureau of Economic Analysis (2024). GDP by State.

Photo credit: Sanford Underground Research Facility

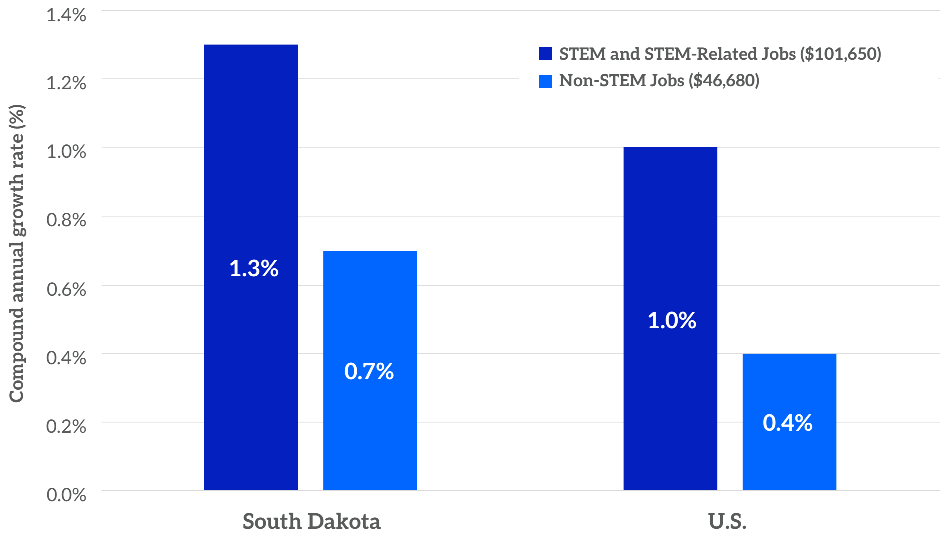
Figure 3. South Dakota Employment by Industry, 2023



Source: U.S. Bureau of Labor Statistics (2024). Quarterly Census of Employment and Wages.

Over the next 10 years, U.S. and South Dakota labor departments forecast that the companies in high-tech services and manufacturing and the STEM jobs these companies create will experience the strongest employment growth. In South Dakota, STEM jobs are projected to grow by 1.3% per year compared to 0.7% growth in non-STEM jobs.[3] Moreover, the median salary of a STEM job is $101,650, compared to the median salary of a non-STEM job, which is $46,680.[4]

Figure 4. Projected 10-Year Annual Growth in STEM vs. non-STEM Jobs in South Dakota and the U.S., 2023-2033



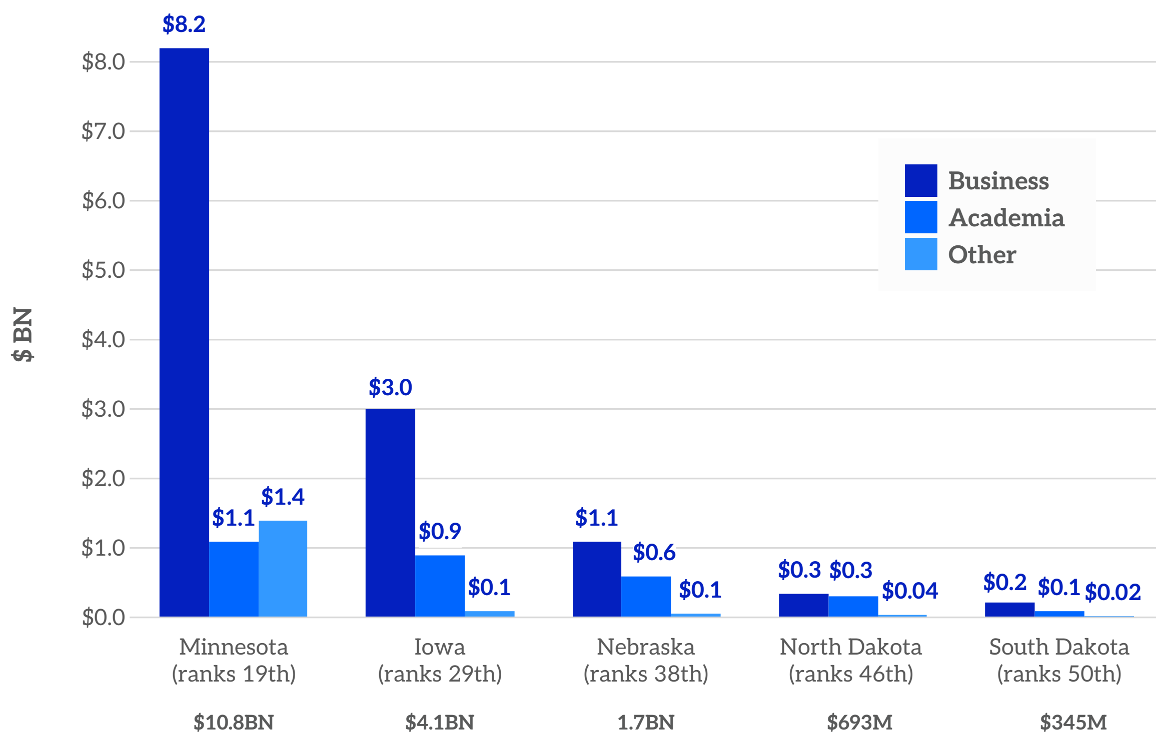
Source: South Dakota Department of Labor and U.S. Bureau of Labor Statistics, Employment Projections

3 South Dakota Department of Labor and Regulation (2024). Employment Projections by Occupation.
4 U.S. Bureau of Labor Statistics (2024). Employment Projections.

Is South Dakota competitively positioned for growth?

In industry, research drives commercialization activity (new products and business lines). In academia, research teaches students intellectual rigor and critical thinking, advances scientific discovery by faculty and graduate students, and supports commercialization in partnership with companies. In 2022, South Dakota companies reported approximately $200 million in R&D expenditures and academic institutions reported $130 million in R&D expenditures. This ranks South Dakota at 47th nationally for business R&D expenditures and 50th academic R&D expenditures.

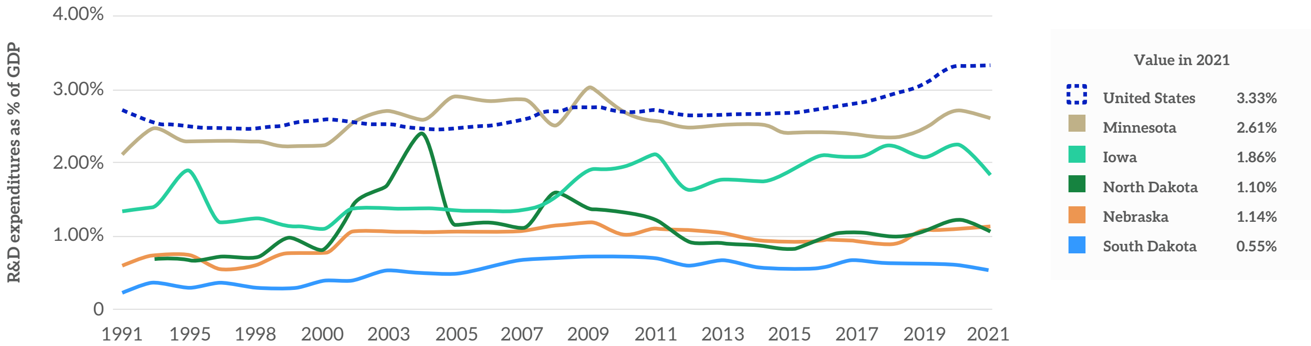
Figure 5. Total R&D Expenditures and National Rank in R&D Expenditures ($BN) for South Dakota and Neighboring States by Performing Sector (Business, Academia, Other), 2021



Source: National Center for Science and Engineering Statistics, National Pattern of R&D Resources.

Compared to its neighboring states and to the national average, South Dakota does not have the R&D intensity to sustain long-term economic growth. An R&D intensity of less than 1% suggests that South Dakota has fewer advanced manufacturing, IT and cybersecurity, and life sciences companies compared to other states, less academic research and tech transfer activity, and fewer STEM graduates at all academic levels.

Figure 6. R&D Intensity for South Dakota, Neighboring States, and the U.S., 1991-2021



Although South Dakota's rankings have fallen, neighboring states like Wyoming and North Dakota have moved up due to sizeable state investments in research, commercialization, and STEM education.

The Business Case for Action

South Dakota must invest in developing research and commercialization activity and the technical and business skills that will enable the next generation of South Dakotans and students educated in South Dakota to build their careers and to launch and expand companies in the state.

Without these workers, South Dakota will not be a competitive location for science- and technology-intensive companies. Without more science- and technology-intensive companies, South Dakota graduates with STEM degrees will need to look for jobs in other states.

Past state investments in research and commercialization with business and philanthropic support have spurred the creation of the Sanford Underground Research Facility, Sanford Research, and successful startup companies, such as VRC Metal Systems, Houdek, Med Gene, and SBS Cybersecurity. These companies were founded to commercialize discoveries and technologies that originated at South Dakota higher education institutions. This plan aims to launch the next wave of STEM innovation.

The Strategy

The S&T Plan presents a vision, plan, and metrics to measure South Dakota's progress in advancing research, commercialization, and workforce that support science- and technology-intensive companies and industries.

Vision

South Dakota invests in research and commercialization to drive economic growth and diversification and to educate a highly prepared STEM workforce.

Mission

Invest in developing the research and commercialization activity, and the technical and business skills, that will enable the next generation of South Dakotans and students educated in South Dakota to build their careers and to launch and expand high-tech companies in the state.

Impact

This plan aims to launch the next wave of STEM innovation in South Dakota. The impact of successful implementation will be a South Dakota that performs exciting research and commercialization activity that is well-funded, attracts and retains leading researchers and students, and involves productive collaborations between universities and companies within and outside the state. This activity will place South Dakota on a higher growth trajectory, evidenced by the state's advancement on key research, STEM workforce, and economic competitiveness metrics.

The strategy leverages assets such as the Sanford Underground Research Laboratory, Sanford Research, Avera Health, and other research- and technology-intensive companies and academic institutions in this research and commercialization plan.

Strategy

1. Advance technology commercialization and the growth of innovation-based companies in South Dakota.

Guiding Principle: Strengthen South Dakota's core research pillars to advance use-inspired research partnerships and technology commercialization aimed at solving practical commercial problems.

Challenge Addressed: South Dakota's economy, measured by GDP, is highly concentrated in finance, agriculture, and real estate. More science- and technology-intensive companies are needed to diversify the economy and generate long-term economic growth and jobs for South Dakotans. Business R&D expenditures totaled $201 million in 2023 ranking South Dakota 47th nationally.

1.1 Work in a coordinated fashion to promote South Dakota's research strengths within and outside the state.

1.2 Work collaboratively to pilot and implement initiatives that support business research and commercialization activity.

A. Expand SBIR/STTR assistance, e.g., by providing state matching funds.
B. Create an industry-university partnership research and commercialization fund to incentivize more industry-sponsored research at universities.

2. Increase research and commercialization activity at higher education institutions by improving system-level operational effectiveness.

Guiding Principle: Ensure that existing and new resources are invested in activities with the highest return and aligned with the goal of expanding federal- and industry-sponsored research activities.

Challenge Addressed: Over the past 10 years, South Dakota academic R&D expenditures grew by only 1.0% per year (from $117 million in 2013 to $129 million in 2023) compared to 4.6% compound annual growth in other EPSCoR states resulting in 50th rank.

2.1 Realign existing state programs to increase the number of Competitive Research Grants and to increase financial support for STEM graduate students.

The South Dakota Board of Regents supports research through three programs: Competitive Research Grants, Governor's Research Centers, and Research Infrastructure Programs.[5]

A. Competitive Research Grants Program:
- Increase the number of grants awarded per year and make all tenure-track faculty eligible to apply.
- Create a professional development program for each Competitive Research Grants cohort focused on Federal grant-writing and strategy.

B. Governor's Research Centers
- Give priority to providing support for graduate students and on new faculty hires who support institutional and state research plans rather than being a primary source of research funding.
- Improve alignment of the Governor's Research Centers program, with this plan's goal of expanding external federal and industry R&D funding.
- Prioritize proposals with strong plans for positioning the collaboration to submit large federally supported centers or hubs that are aligned to institutional research plans and demonstrate commitment from the institution, departments, industry, and other partners.

C. Research Infrastructure Program
- Prioritize projects that will enhance infrastructure statewide over single principal investigator efforts.
- Shift funding to support the first year for 20 select STEM graduate students with the expectation that they will be supported by federal grants for subsequent years.

2.2 Improve system-wide research and technology transfer operational effectiveness.

Areas identified to support the growth of institutional research programs include:

A. Faculty:
- To support release time for faculty with research projects, more faculty are needed in STEM departments with high teaching loads, especially in parts of the state where it is difficult to find adjunct faculty.
- Use faculty cluster hires to provide complementary expertise to position the state for larger STEM research centers.

5 The current state appropriation for the three programs are $450,000 annually for Competitive Research Grants; f $3.2 million annually for Governor's Research Centers; and $1 million annually for the Research Infrastructure Program. There is also a $600,000 appropriation for the National Science Foundation EPSCoR match.

B. Research policies:
   - Align Board of Regents policies related to faculty research leaves and fellowships, faculty consulting and advising, intellectual property, etc., with a goal of incentivizing research and commercialization activity.
   - Analyze shared services to provide pre- and post-award support and federal agency-specific expertise to institutions.

C. Research collaboration with industry and technology transfer:
   - Analyze system-wide, standard industry-sponsored research templates.
   - Implement system-wide standard policies for licensing intellectual property.
   - Analyze shared services to support intellectual property management and tech transfer activities at institutions.
   - Support commercialization and entrepreneurship programs at South Dakota universities, including i-Corps, the Giant Vision business plan competition, and other campus initiatives.

D. Research administration job classifications:
   - Create research administration–specific job classifications.
   - Ensure that classifications allow for progression in roles and responsibilities.

2.3 **Establish well-articulated institutional research plans to increase communication and elevate shared goals.**
- Use plans to drive faculty hiring decisions and graduate student recruitment.
- Use plans to communicate institutional priorities for philanthropic fundraising and private sector partnerships.

3. Develop a South Dakota "grow our own" STEM talent initiative.

Guiding Principle: In the same way that workforce talent powers high-growth companies, high-quality STEM graduate students and faculty are the lifeblood of university research. South Dakota seeks to create stronger incentives to attract and retain STEM talent.

Challenge Addressed: South Dakota institutions are not providing competitive financial support that can attract the best and brightest STEM graduate students. Retention of early-career faculty is a challenge. More work is needed to expand internships, coops, and apprenticeships with companies.

3.1 Improve articulation agreements between institutions that serve primarily undergraduate students and research universities with graduate programs to expand the STEM graduate pipeline.

3.2 Increase financial support (stipends and health insurance) for select STEM graduate research assistants and teaching assistants to federal levels ($45,000 per student) in their first year, with the expectation that financial support for these students would be externally funded in subsequent years of their graduate degree.

3.3 Expand internships, coops, research experiences, and company tuition reimbursement options for students. Track number of companies participating and number of students.

4. Launch a 10-year $50 million initiative to invest in faculty, STEM workforce, and university-industry research and commercialization.

Guiding Principle: Establish long-term, sustained investment to build South Dakota's research capacity, foster public-private collaboration, and ensure economic resilience through innovation.

Challenge Addressed: States that have experienced growth in research and commercialization activity are states that have invested over a sustained period. Examples of such states include Wyoming, North Dakota, Indiana, Utah, Texas, Arizona, Georgia, and North Carolina.

4.1 Develop a strategy to generate support for a $50 million investment over 10 years from industry, philanthropic donors, state appropriations, and other sources that is consistent with the South Dakota S&T Plan and institutional research plans.
4.2 Reinvest existing dollars in strategic priorities to build the foundation and infrastructure to implement this initiative.
4.3 Recruit research faculty in high-priority areas aligned to state and institutional research strategies and high-growth industries.
4.4 Invest in the "grow our own" STEM talent initiative to provide support for STEM workforce training (internships, coops, and apprenticeships), stipends, and scholarships.
4.5 Expand university-industry research and commercialization partnerships, including industry sponsorship of graduate students or a public-private matching fund model.

5. Develop a plan to leverage federal investment to build public-private research and commercialization partnerships in high-priority opportunity areas.

Guiding Principle: Maximize South Dakota's access to federal funding and private investment by fostering strategic collaborations, aligning state priorities with national research initiatives, and ensuring a strong return on investment for public and private stakeholders.

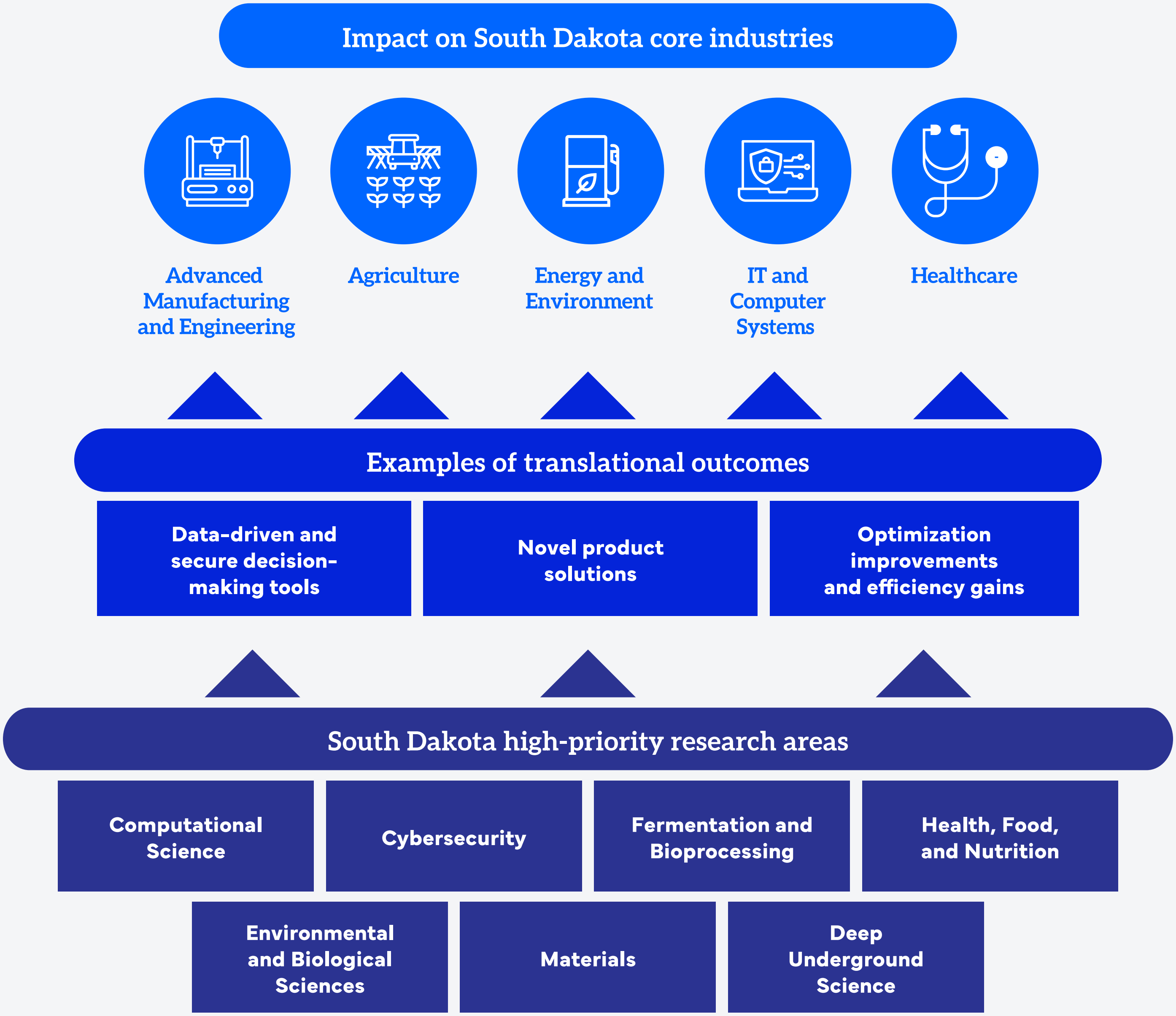
Challenge Addressed: South Dakota has not fully capitalized on available federal research and commercialization funding opportunities. Limited coordination and industry engagement in large-scale federal funding proposals have restricted the state's ability to attract high-impact federal investments.

5.1 Develop a more defined value proposition (need, approach, benefit, investment) for each of the high-priority opportunity areas:

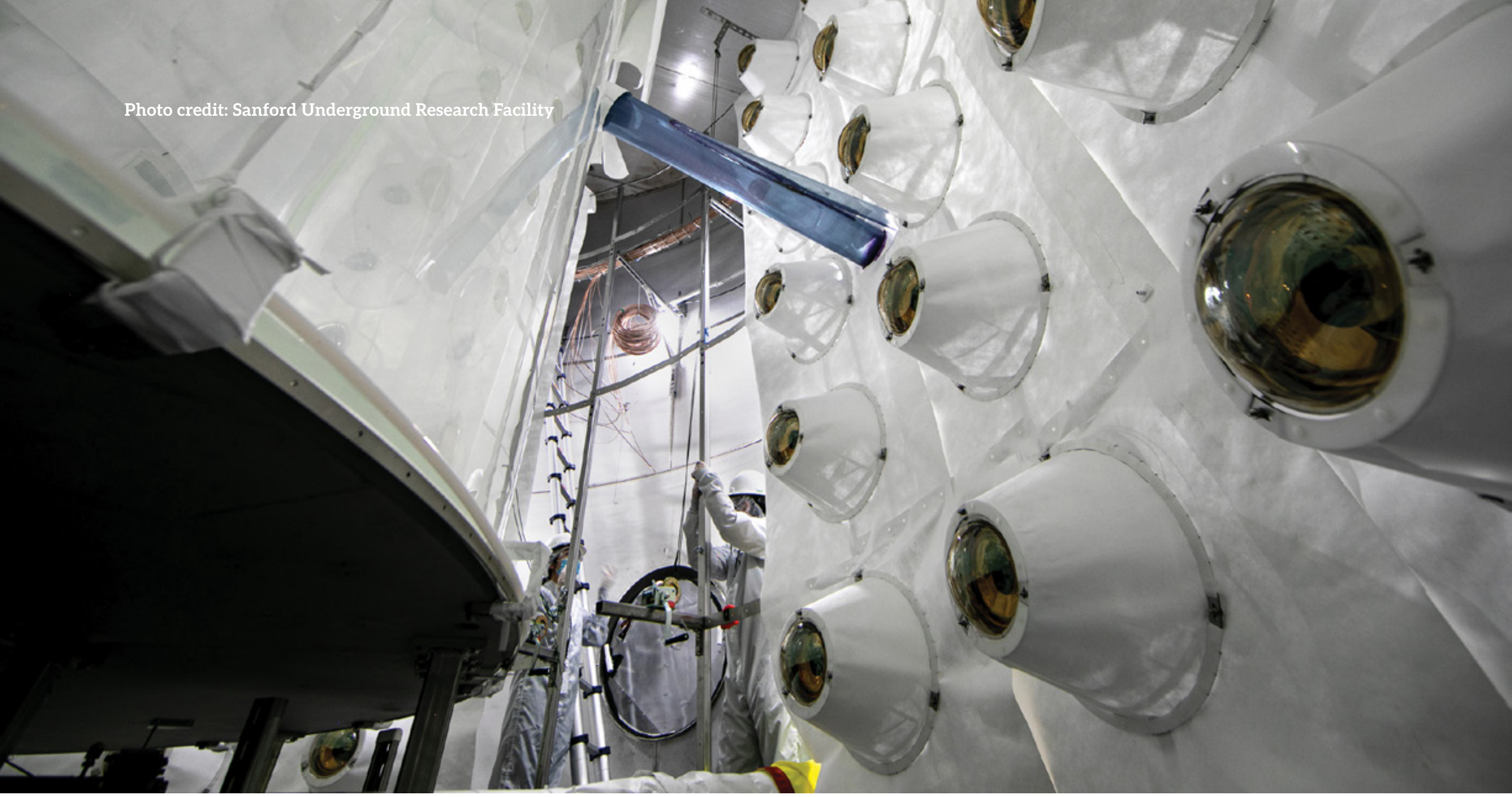
- cybersecurity and data analytics
- deep underground science and engineering
- bioprocessing and precision agriculture
- clinical research, health care, and computational science
- critical minerals, environmental science, and water

5.2 Identify sources of federal funding and the type of match or co-investment required.
5.3 Develop and implement strategies to pursue and secure federal investment in high-priority areas.
5.4 Promote South Dakota as a state for high-tech industry and research to attract external investment.

Figure 7. South Dakota High-Priority Research Areas, Examples of Translational Outcomes, and Impact on South Dakota Core Industries



AI = Artificial intelligence; ML = Machine learning; ag = Agriculture



Governance

Guiding Principle: The governing body for this strategic plan should reflect the importance that South Dakota companies and academic institutions place on research and commercialization activity as a driver of long-term economic growth. It should include members who will advocate for action and investment.

Challenge Addressed: The current REACH Executive Committee and Research Affairs Council do not have staff to support strategic plan implementation. Industry-university research and commercialization alliances of this type often reside within nonprofit 501c3 organizations which provides the organizational capacity to generate fee-for-service revenue, as well as apply for state and federal grants or raise private investment to fund operations.

This plan will require the leadership and coordination of: (1) the industry-led South Dakota EPSCoR REACH Executive Committee, (2) the vice presidents for research and research administrators of South Dakota's six public universities, and (3) the state via the Governor's Office for Economic Development. Structured quarterly meetings should be set for this steering committee to work on plan implementation. Support is needed not only for strategic decision making and oversight, but also for day-to-day execution and coordination.

The Impact

This plan aims to launch the next wave of STEM innovation in South Dakota. The impact of successful implementation will be a South Dakota that performs exciting research and commercialization activity that is well funded, attracts and retains leading researchers and students, and involves productive collaborations among universities and companies within and outside the state. The execution of plan initiatives through 2030 will catalyze the following anticipated impacts by 2035, as shown in the figure below.

Operational Effectiveness

- Reinvest dollars from existing programs to support R&D growth
- Invest in commercialization and entrepreneurship support programs
- Standardize intellectual property and sponsored research templates

Key Metrics

- # of faculty receiving federal grants for the first time
- # of invention disclosures
- # of licenses executed
- # of companies sponsoring research

Impact Areas		Now 2023	Future 2035
1 Research and Commercialization	Business R&D expenditures	$201M	$350M
	Academic R&D expenditures	$129M	$250M
	Industry-sponsored academic R&D	$2.5M	$7.5M
	Licenses executed	2	10
2 High-Tech Companies	High-tech employment	18,558	28,000
	3-year average SBIR/STTR awards	6	18
	3-year average SBIR/STTR value	$3M	$9M
	5-year total VC deal flow	38	65
	5-year VC Investment	$57M	$125M
3 STEM Talent	Associate STEM degrees	717	950
	Bachelor's STEM degrees	2,963	3,750
	Master's STEM degrees	855	1,425
	PhD STEM degrees	116	215

Note: STEM degrees includes all science and engineering and health sciences degrees. The 3-year averages calculated for SBIR and STTR awards are for 2021-2023 and 2033-2035. The 5-year totals calculated for VC deal flow and investment are for 2019-2023 and 2031-2035. Nondisclosure of VC deal size may cause these values to be understated.

Appendix

List of Contributing Stakeholders

Higher Education

Black Hills State University

Cynthia Anderson, PhD, Dean, College of Business and Natural Sciences
Yun Seok Choi, PhD, Assistant Professor, School of Natural Sciences
Emilia Flint, PhD, Professor of Psychology/Behavioral Sciences and Chair, School of Behavioral Sciences
Charles Lamb, PhD, Chief Research Officer
Brianna Mount, PhD, Associate Professor of Physics
Ashley Pfeiffer, PhD, Assistant Professor of Exercise Science
Ben Sayler, PhD, Professor of Physical Sciences and Mathematics, Director, Center for the Advancement of Math and Science Education, Director, Sanford Science Education Center
Craig Triplett, PhD, Associate Professor of Exercise Science

Dakota State University

Richard Avery, PhD, Professor of Mathematics
Kyle Cronin, DSc, Associate Professor of Cyber Operations, Coordinator for PhD in Cyber Defense
Alex Dececchi, PhD, Assistant Professor of Biology
David De Jong, EdD, Dean, College of Education
Omar El-Gayar, PhD, Professor of Information Systems
Peng Guo, PhD, Assistant Professor of Physics
Fenecia Homan, EdD, Dean, Governor's Cyber Academy
Pete Hoesing, PhD, Associate Vice President for Research and Economic Development
Cherie Noteboom, PhD, Professor of Information Systems
Ashley Podhradsky, DSc, Vice President for Research and Economic Development
Andrew Sathoff, PhD, Assistant Professor of Biology, Science Program Coordinator
Mark Spanier, PhD, Interim Dean, College of Arts and Sciences
Yong Wang, PhD, Associate Dean, Beacom College of Computer and Cyber Sciences
Joel Wohnoutka, MS, Executive Director, Applied Research Lab

Northern State University

Amy Dolan, PhD, Assistant Professor of Biology, STEM Outreach Coordinator
John Long, PhD, Associate Professor of Environmental Physics and Chair, Department of Science and Mathematics
Alyssa Kiesow, PhD, Dean of College of Arts and Sciences and Director of Sponsored Projects
Jon Mitchell, PhD, Professor, Biochemistry
George Nora, PhD, Associate Professor, Chemistry
Eric Pulis, PhD, Assistant Professor, Biology
Leslie Sauder, PhD, Assistant Professor, Teacher Education

Oglala Lakota College

Dana Gehring, MA, Chair of Math, Science, and Technology
Camille Griffith, PhD, Assistant Professor, GIS and Remote Sensing
Alessandra Higa, MS, Assistant Professor, Conservation Biology
Nick Klein, PhD, Assistant Professor, Earth Sciences
John Foster Sawyer, PhD, Assistant Professor, Geology and Earth Sciences
Charles "Jason" Tinant, PhD, Professor, Pre-engineering and Earth Sciences
Karla Witt, Vice President for Instruction

South Dakota Mines

Laurie Anderson, PhD, Vice President for Research
Richard Avery, PhD, Professor of Mathematics
Xinhua Bai, PhD, Professor of Physics
Cassandra Birrenkott, PhD, Associate Professor of Mechanical Engineering
Grant Crawford, PhD, Professor of Materials and Metallurgical Engineering and Director of Arbegast Materials Processing and Joining Laboratory
Edward Duke, PhD, South Dakota NASA EPSCoR Director, Professor of Geology and Geological Engineering, Manager of Analytical Services of Engineering and Mining Experiment Station
Venkataramana Gadhamshetty, PhD, Professor of Civil and Environmental Engineering
Randy Hoover, PhD, Professor of Electrical Engineering and Computer Science
Bharat Jasthi, PhD, Associate Professor of Materials and Metallurgical Engineering
Jon Kellar, PhD, Professor/Douglass Fuerstenau Professor/Nucor Professor
Timothy Masterlark, PhD, Mickelson Professor of Geology and Geological Engineering
Rajesh Sani, PhD, Professor of Chemistry, Biology and Health Sciences
Christopher Shearer, PhD, Associate Professor/William V. Coyle Professor of Civil Engineering
Steve Smith, PhD, Department Head and Professor of Nanoscience and Biomedical Engineering
James Stone, PhD, Department Head and Professor of Civil and Environmental Engineering
Richard Schnee, PhD, Department Head and Professor of Physics
Gokce Ustunisik, PhD, Associate Professor of Geology and Geological Engineering
Congzhou Wang, PhD, Associate Professor of Nanoscience and Biomedical Engineering
Zhengtao Zu, PhD, Department Head and Professor of Chemistry, Biology, and Health Sciences

South Dakota State University

Wenfeng An, PhD, Professor and Markl Faculty Scholar in Cancer Research
Triwit Ariyathugun, PhD, Assistant Professor of Economics
Allison Barry, PhD, Assistant Professor, School of Health and Consumer Sciences
John Blanton, PhD, Professor and Associate Dean for Research, Director of South Dakota Ag Experiment Station, College of Agriculture, Food, and Environmental Sciences
Suvobrata Chakravarty, PhD, Associate Professor, Chemistry and Biochemistry
David Clay, PhD, South Dakota Corn Chair and Distinguished Professor of Agronomy, Horticulture, and Plant Science
Alison Coulter, PhD, Assistant Professor of Natural Resource Management
Xijin Ge, PhD, Professor of Bioinformatics
Adam Hoppe, PhD, Professor, Chemistry and Biochemistry
Brian Logue, PhD, Department Head and Professor, Chemistry, Biochemistry, and Physics
Maitiniyazi Maimaitijian, PhD, Assistant Professor of Remote Sensing and GIS
Jessica Meendering, PhD, Professor, School of Health and Consumer Sciences and Program Director, Exercise Science Program
Sarah Mollman, PhD, Associate Dean for Research and PhD Program Director, College of Nursing
Komal Reina, PhD, Associate Professor and Haarberg Chair in Cancer Research

Joshua Reineke, PhD, Associate Professor and Haarberg Drug, Disease, and Delivery Research Director
Daniel Scholl, PhD, Vice President for Research and Economic Development
Sen Subramanian, PhD, Professor and Associate Dean of Research, College of Natural Sciences
Natalie Thiex, PhD, Associate Professor, Biology and Microbiology
Matt Vukovich, PhD, Professor and Associate Dean of Research, College of Education and Human Sciences
Hankui Zhang, PhD, Assistant Professor and Research Scientist
Xiaoyang Zhang, PhD, Distinguished Professor of Geography & Geospatial Sciences, Co-Director, Geospatial Sciences Center of Excellence
Weiwei Zhang, PhD, Assistant Professor of Sociology
Jason Zimmerman, PhD, Associate Dean, College of Arts, Humanities, and Social Sciences, University of South Dakota

University of South Dakota

Christopher Anderson, PhD, Associate Professor of Biology
Lee Baugh, PhD, Associate Professor of Neuroscience
Brian Burrell, PhD, Professor, Basic Biomedical Sciences Division
William Chen, PhD, Assistant Professor of Basic Biomedical Sciences Division
Bridget Diamond-Welch, PhD, Director of Research and Innovation, School of Health Sciences, Assistant Professor, Public Health Department
John Dudley, Dean, College of Arts and Sciences, Lohre Distinguished Professor of English
Dan Engebretson, PhD, Vice President for Research and Economic Development
James Hoefelmeyer, PhD, Professor and Chair of Chemistry
Chaoyang Jiang, PhD, Professor of Chemistry
Lisa MacFadden, PhD, Professor of Practice, Director of Biomechanics Research
William Mayhan, Dean of Basic Biomedical Science
Dongming Mei, PhD, Professor of Physics, Director of Center for Ultra-low Background Experiments at Dakota (CUBED)
Daniel Mourlam, EdD, Associate Professor and Chair, Teacher Residency and Education
Jose Pietri, PhD, Associate Professor, Basic Biomedical Sciences Division, Microbiology
Haifa Samra, Dean, School of Health Science
Joel Sander, PhD, Coordinator of Graduate Programs, Associate Professor of Physics
Grigoriy Sereda, PhD, Professor of Chemistry
Haoran Sun, PhD, Professor of Chemistry
David Swanson, PhD, Director of Research, Missouri River Institute, Biology Department
Xuejan Wang, PhD, Associate Professor of Basic Biomedical Sciences/Director of the Physician Scientist Program
Jeff Wesner, PhD, Professor of Biology, South Dakota EPSCoR
Kinchel Doerner, PhD, Director, South Dakota EPSCoR
Mel Ustad, EdD, Principal Investigator, NSF Track-1 South Dakota EPSCoR

Industry

Christoph Bausch, PhD, MBA, Executive Vice President and Chief Operating Officer, SAB Biotherapeutics
Deb Wolf, Director of Outreach and Culture, Sanford Underground Research Facility
Joni Ekstrum, Executive Director, South Dakota Biotech Association
Ken Harding, MineStar Collaboration Center Manager, Caterpillar Mining
Jaret Heise, PhD, Director of Science, Sanford Underground Research Facility
Jared Kocer, Director of Technology, Precision Electronics, CNH Industrial
Todd Kenner, CEO, RESPEC Consulting & Services
Thomas Johnson, PharmD., MBA, Vice President, Hospital Pharmacy and Laboratory Services, Avera Health
Kara McCormick, PhD, Director of Science and Operations, South Dakota Biotech Association

Regional Economic Development and Chambers of Commerce

Dean Dziedzic, Vice President of Economic Development, Sioux Falls Development
Tom Johnson, President and CEO, Elevate Rapid City
Garth Wadsworth, Public Policy Director, Elevate Rapid City

State Economic Development

Joe Fiala, Commissioner, Governor's Office of Economic Development

Venture Capital and Venture Development Organizations

Craig Arnold, CEO, Dakota BioWorx
Tom Eitreim, Executive Director, The Enterprise Institute
Darren, Haar, Chair, Black Hills Regional Angel Fund
Sue Lancaster, Chief Commercialization Officer, South Dakota Innovation Partners
Mark Stowers, PhD, Co-Founder and Managing Partner, South Dakota First Capital, and Managing Director, The Global Bluefish Company LLC

High-Tech Industry

Figure 1

Research and development (R&D)-intensive industries are defined by an industry's total R&D expenditures as a share of value-added output. High- and medium-high R&D intensity manufacturing and services industries are shown below. They are commonly referred to as high-tech services and high-tech or advanced manufacturing.

Definition of High and Medium-High R&D-intensive industries in the United States

NAICS 2012	Industry Title	R&D Intensity
High R&D Intensity: Manufacturing		
3364	Aerospace product and parts mfg.	31.69%
3254	Pharmaceutical and medicine mfg.	27.98%
334	Computer and electronic products mfg.	24.05%
333314	Optical instrument and lens mfg.	24.05%
Medium-High R&D Intensity: Manufacturing		
3361-3363	Motor vehicle mfg.	15.36%
3391	Medical equipment and supplies mfg.	9.29%
332913, 332991	Other fabricated metal products mfg.	7.89%
3331, 3332, 3334, 3335, 3336, 3339	Machinery mfg. (agricultural, industrial, metalworking, HVAC, power transmission)	7.89%
333316	Photographic and photocopying equipment mfg.	7.89%
333318	Other commercial and service industry machinery mfg.	7.89%
335	Electrical equipment, appliance, and component mfg.	6.22%
3251, 3252, 3253, 3255, 3256, 3259	Chemical mfg., excluding pharmaceuticals	6.52%
3365, 3369	Railroad and other transportation equipment mfg.	5.72%
High R&D Intensity: Services		
5112	Software publishers	28.94%
5417	Scientific research and development services	30.39%
Medium-High R&D Intensity: Services		
5415	Computer systems design and related services	5.92%
518	Data processing, hosting, and related services	5.92%
519	Other information services	5.92%

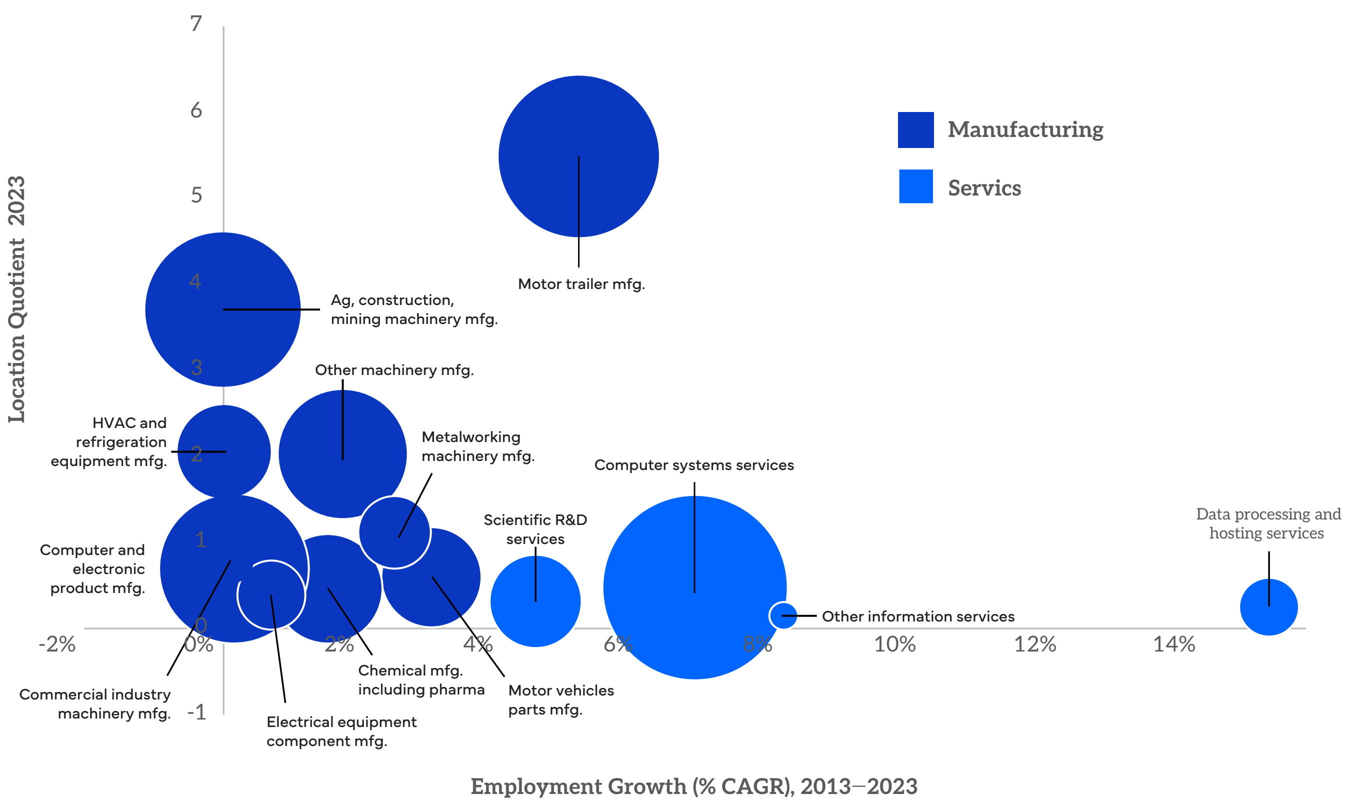
NAICS = North American Industry Classification System; Mfg. = Manufacturing; HVAC = Heating, ventilation, and air conditioning

Sources: Galindo-Rueda, F. & Verger, F. (2016). OECD taxonomy of economic activities based on R&D intensity. OECD Science, Technology, and Industry Working Papers. OECD Publishing. National Science Board (2022). SAKTI-3 Concordance for Knowledge and Technology Intensive Industry Employment.

Figure 2

South Dakota high-tech manufacturing employment is larger than that of high-tech services, as indicated by the size of the bubble for each industry. However, employment in high-tech service industries is growing faster, on average, as indicated by the positioning of the lighter blue bubbles on the x-axis, which is the compound annual growth rate (CAGR) of employment in these industries.

South Dakota High-Tech Industry Segment Employment Growth and Employment Concentration (LQ), 2013-2023



LQ = location quotient; the location quotient measures how concentrated an industry's employment is in a state or region compared to the national average

Source: U.S. Bureau of Labor Statistics (2023). Quarterly Census of Employment and Wages, multiple years.

Figure 3

Over the past 10 years, South Dakota's high-tech sector employment has grown by a 2.4% CAGR adding 3,982 total jobs. Computer systems design services and motor vehicle trailer manufacturing—which added 1,673 jobs and 1,052 jobs respectively—drove most of this job growth, followed by scientific R&D services, data processing, and other machinery manufacturing.

Size and Growth of South Dakota's High-Tech Industry Segments, 2013 and 2023

NAICS	Industry Title	2013	2023	10-year change	10-year CAGR	2023 LQ
5415	Computer systems design and related services	1,817	3,490	1,673	6.7%	0.48
3362	Motor vehicle trailer mfg.	1,640	2,692	1,052	5.1%	5.49
5417	Scientific research and development services	561	868	307	4.5%	0.32
518	Data processing, hosting, and related services	89	359	270	15.0%	0.25
3339	Other machinery mfg.	1,443	1,708	265	1.7%	2.03
3363	Motor vehicles parts mfg.	746	1,000	254	3.0%	0.6
325	Chemical mfg., including pharmaceuticals	1,043	1,209	166	1.5%	0.46
3335	Metalworking machinery mfg.	418	532	114	2.4%	1.12
519	Other information services	37	80	43	8.0%	0.15
334	Computer and electronic product mfg.	2,239	2,271	32	0.1%	0.7
335	Electrical equipment, appliance, component mfg.	443	474	31	0.7%	0.39
3333	Commercial industry machinery mfg.	207	209	2	0.1%	0.79
3331	Agriculture, construction, mining machinery mfg.	415	2,412	(3)	0.0%	3.71
3361, 3364	Motor vehicle mfg. and aerospace parts mfg.	229	58	(171)	0.0%	N/A
3334	HVAC and refrigeration equipment mfg.	ND	880	ND	N/A	2.06*
3336	Engine, turbine, and power transmission equipment mfg.	752	ND	ND	N/A	2.53*
5112	Software publishers	222	ND	ND	N/A	0.25*
3332	Industrial machinery mfg.	ND	ND	ND	N/A	N/A
	TOTAL	**14,576**	**18,558**	**3,982**	**2.4%**	**N/A**

NAICS = North American Industry Classification System; CAGR = Compound annual growth rate; LQ = Location quotient; mfg = Manufacturing; HVAC = Heating, ventilation, and air conditioning. The LQ shows South Dakota's concentration of employment in an industry relative to the national average. The higher the concentration, the higher South Dakota's specialization in this industry.

* Indicates that the LQ is for the year that employment was disclosed.

Source: U.S. Bureau of Labor Statistics (2023). Quarterly census of employment and wages, multiple years.

STEM Workforce

Figure 4

In 2023, South Dakota's population was 919,318, 84.2% white, and 8.6% American Indian, which is sizeable relative to the U.S. average of 1.6%. The Sioux are the largest Tribal grouping in South Dakota. South Dakotans who identify as two or more races, Black, or Asian each represent 3% or less of the population. South Dakotans of any race who identify as Hispanic represent 5.1% of the population.

Breakdown of South Dakota Population by Race and Ethnicity, 2023

Race and Ethnicity	U.S. Population %	South Dakota Population %
Total Population	**334,914,895**	**919,318**
White	**75.3%**	**84.2%**
American Indian and Alaskan Native	**1.6%**	**8.6%**
Sioux Tribal grouping	-	6.1%
Two or More Races	**3.1%**	**2.8%**
Black	**13.7%**	**2.6%**
Asian	**6.4%**	**1.8%**
Total	**100%**	**100%**
Hispanic	19.5%	5.1%

Note: Hispanic is an ethnicity, and people who identify as Hispanic identify as many different races.

Source: U.S Census Bureau (2024). American Community Survey, 2022, 5-Year Estimates.

Figure 5

Nationally and in South Dakota, STEM jobs are projected to grow faster than non-STEM jobs over the next 10 years. As shown in the table, STEM jobs have also grown faster than non-STEM jobs since 2013. Employment in South Dakota S&E, S&E-related, and skilled technical and middle skill jobs grew by 2.9% per year, 2.2% per year, and 1.5% per year, respectively, while non-STEM jobs grew by 0.6% over this 10-year period.

South Dakotans Employed in STEM Occupations and CAGR, 2013, 2018, and 2023

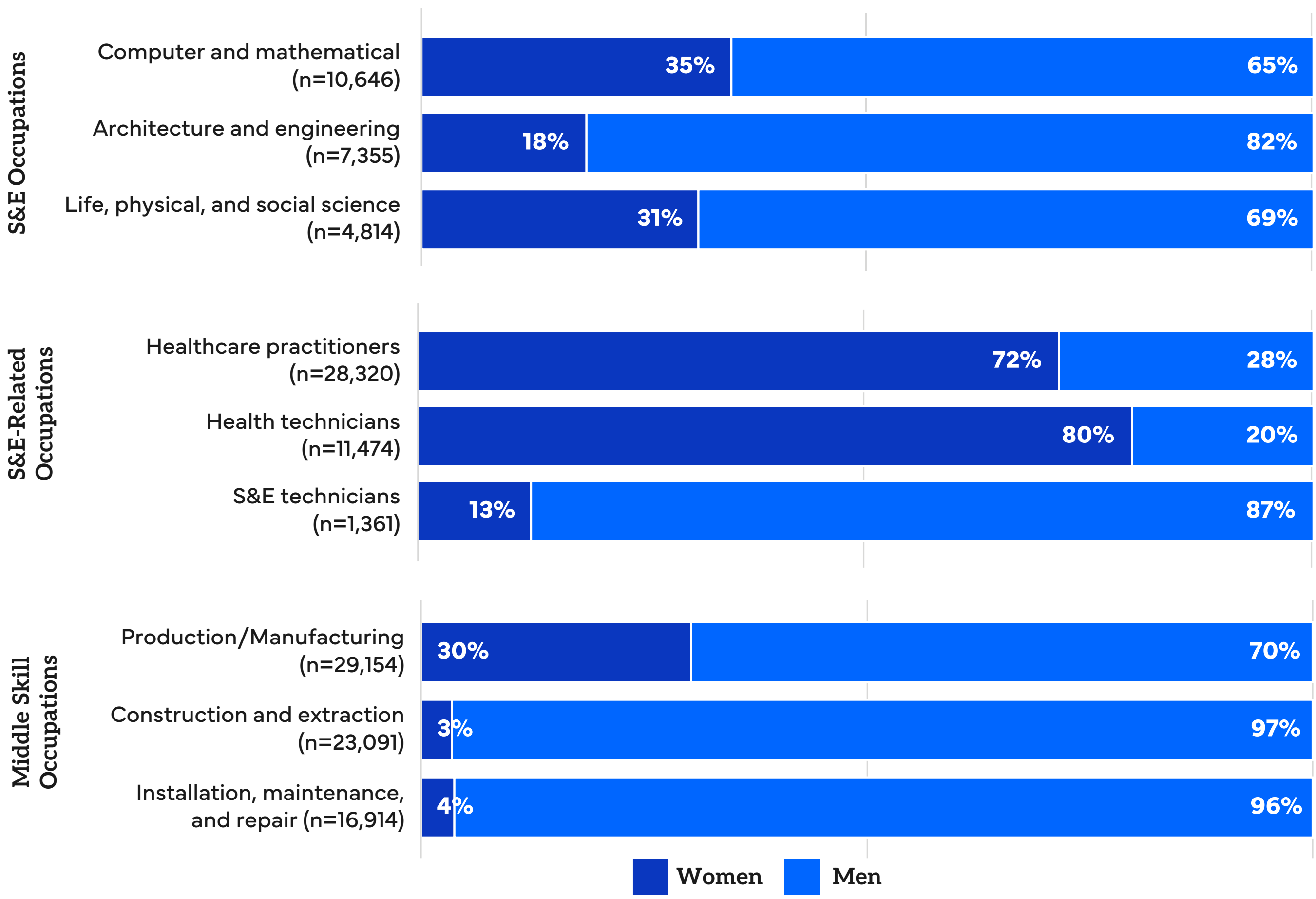
Occupation	2013	2018	2023	10-Year CAGR	5-Year CAGR
S&E					
Computer and mathematics	6,610	8,160	9,680	3.9%	3.5%
Engineering	4,010	4,340	5,350	2.9%	4.3%
Life, physical, and social science	3,320	3,920	4,300	2.6%	1.9%
S&E manager and sales	1,810	2,070	2,170	1.8%	0.9%
S&E postsecondary teachers	830	810	650	-2.4%	-4.3%
S&E Total	**16,580**	**19,300**	**22,150**	**2.9%**	**2.8%**
S&E-Related					
Healthcare practitioners	18,010	20,520	24,010	2.9%	3.2%
Health technicians	9,870	10,500	10,410	0.5%	-0.2%
Medical and health services managers	630	730	1,050	5.2%	7.5%
Architects and architectural drafters	380	430	600	4.7%	6.9%
Health and architecture postsecondary teachers	390	410	460	1.7%	2.3%
S&E-Related Total	**29,280**	**32,590**	**36,530**	**2.2%**	**2.3%**
Skilled Technical/Middle Skill					
Production/manufacturing	30,400	32,440	32,010	0.5%	-0.3%
Construction and extraction	19,670	22,060	24,840	2.4%	2.4%
Installation, maintenance, and repair	15,510	16,950	19,620	2.4%	3.0%
Skilled Technical/Middle Skill Total	**65,580**	**71,450**	**76,470**	**1.5%**	**1.4%**
STEM Total	111,440	123,340	135,150	1.9%	1.8%
Non-STEM Total	291,550	298,970	309,250	0.6%	0.7%
All Occupations	**402,990**	**422,310**	**444,400**	**1.0%**	**1.0%**

Source: South Dakota Department of Labor and Regulation (2024). Statewide Occupation Projections.

Figure 6

In South Dakota, men accounted for 71.3% of combined computer and math, architecture and engineering, and life, physical, and social science employment in 2022. Women accounted for 73.5% of combined healthcare practitioner, health technician, and life, physical, and S&E technician employment. Men also accounted for 85.2% of skilled technical or middle skill occupation employment (production, constructions, and installation, maintenance, and repair).

Breakdown of South Dakota STEM Workforce Employment by Sex, 2022



Source: U.S Census Bureau (2024). American Community Survey.

Figure 7

Over the past five years, growth in awarded S&E degrees in South Dakota has slowed or declined at all levels (associate through PhD). During the same period, conferred graduate degrees in health sciences grew, but bachelor's degrees in health sciences saw the second-biggest decline (after education). Meanwhile, the number of education degrees awarded at any level declined. Students receiving S&E, health sciences, and education degrees include those from other states and countries.

South Dakota Total Degrees Awarded in S&E, Health Sciences, and Education Disciplines by Level, 2013, 2018, 2023, and CAGR

Degree Type	2013	2018	2023	10-Year CAGR	5-Year CAGR
Associate Degree					
S&E	**186**	**201**	**264**	**3.6%**	**5.6%**
Sciences	180	189	262	3.8%	6.8%
Pre-engineering	6	12	2	-10.4%	-30.1%
Health Science	**755**	**404**	**453**	**-5.0%**	**2.3%**
Education	**23**	**12**	**19**	**-1.9%**	**9.6%**
Bachelor's Degree					
S&E	**1,723**	**1,929**	**1,915**	**1.1%**	**-0.1%**
Sciences	1,377	1,465	1,466	0.6%	0.0%
Engineering	346	464	449	2.6%	-0.7%
Health Science	**992**	**1,242**	**1,048**	**0.6%**	**-3.3%**
Education	**533**	**633**	**465**	**-1.4%**	**-6.0%**
Master's Degree					
S&E	**399**	**541**	**594**	**4.1%**	**1.9%**
Sciences	280	377	451	4.9%	3.6%
Engineering	119	164	143	1.9%	-2.7%
Health Science	**177**	**239**	**261**	**4.0%**	**1.8%**
Education	**360**	**482**	**456**	**2.4%**	**-1.1%**
PhD Degree					
S&E	**62**	**105**	**94**	**4.2%**	**-2.2%**
Sciences	48	80	71	4.0%	-2.4%
Engineering	14	25	23	5.1%	-1.7%
Health Science	**7**	**15**	**22**	**12.1%**	**8.0%**
Education	**37**	**29**	**27**	**-3.1%**	**-1.4%**

Source: National Center of Education Statistics (2024). Integrated Postsecondary Education Data System (IPEDS) Completions Survey, multiple years.

Figure 8

Associate degrees in S&E awarded by South Dakota institutions are nearly all awarded in the sciences, especially computer science, but also the biological sciences, social sciences, and agricultural sciences. Only a couple of associate degrees in engineering were awarded in 2023.

South Dakota Associate Degrees Awarded in S&E, Health Sciences, and Education Disciplines, 2013, 2018, 2023, and CAGR

Associate Degrees	2013	2018	2023	10-Year CAGR	5-Year CAGR
S&E	**186**	**201**	**264**	**3.6%**	**5.6%**
Sciences	**180**	**189**	**262**	**3.8%**	**6.8%**
Computer sciences	132	130	168	2.4%	5.3%
Biological sciences	6	29	37	20.0%	5.0%
Social sciences	23	25	33	3.7%	5.7%
Agricultural sciences	13	2	23	5.9%	63.0%
Mathematics and statistics	0	0	1		
Physical sciences	6	3	0	-100.0%	-100.0%
Engineering	**6**	**12**	**2**	**-10.4%**	**-30.1%**
Other engineering	6	12	2	-10.4%	-30.1%
Health Science	**755**	**404**	**453**	**-5.0%**	**2.3%**
Education	**23**	**12**	**19**	**-1.9%**	**9.6%**

Source: National Center of Education Statistics (2024). Integrated Postsecondary Education Data System (IPEDS) Completions Survey, multiple years.

Figure 9

Bachelor's degrees in science awarded by South Dakota institutions have not grown over the last 5 years, and bachelor's degrees awarded in engineering have declined. Awards of bachelor's degrees in education declined by 1.4% per year over the past 10 years and fell even faster (-6.0% per year) over the past 5 years. Awards of bachelor's degrees in health sciences fell by 3.3% over the past 5 years.

South Dakota Bachelor's Degrees Awarded in S&E, Health Sciences, and Education Disciplines, 2013, 2018, 2023, and CAGR

Bachelor's Degrees	2013	2018	2023	10-Year CAGR	5-Year CAGR
S&E	**1,723**	**1,929**	**1,915**	**1.1%**	**-0.1%**
Sciences	**1,377**	**1,465**	**1,466**	**0.6%**	**0.0%**
Biological sciences	278	348	317	1.3%	-1.8%
Computer sciences	170	277	312	6.3%	2.4%
Psychology	237	201	262	1.0%	5.4%
Agricultural sciences	189	231	212	1.2%	-1.7%
Social sciences	381	299	203	-6.1%	-7.5%
Mathematics and statistics	68	46	91	3.0%	14.6%
Physical sciences	54	63	69	2.5%	1.8%
Engineering	**346**	**464**	**449**	**2.6%**	**-0.7%**
Mechanical engineering	90	176	148	5.1%	-3.4%
Civil engineering	80	104	86	0.7%	-3.7%
Electrical engineering	65	61	48	-3.0%	-4.7%
Chemical engineering	27	32	42	4.5%	5.6%
Industrial engineering	34	29	42	2.1%	7.7%
Biomedical engineering	-	-	22	-	NA
Materials engineering	14	4	20	3.6%	38.0%
Other engineering	36	58	41	1.3%	-6.7%
Health Science	**992**	**1,242**	**1,048**	**0.6%**	**-3.3%**
Education	**533**	**633**	**465**	**-1.4%**	**-6.0%**

Source: National Center of Education Statistics (2024). Integrated Postsecondary Education Data System (IPEDS) Completions Survey, multiple years.

Figure 10

Master's degrees in science awarded by South Dakota institutions grew from 280 awards in 2013 to 451 in 2023, driven by growth in computer sciences, physical sciences, biological sciences, and mathematics and statistics. Awards of master's degrees in engineering grew over the past 10 years but declined over the past 5 years. South Dakota saw the biggest declines in civil, industrial, and chemical engineering. Awarded master's degrees in education fell over the past 5 years, while master's in health sciences grew.

South Dakota Master's Degrees Awarded in S&E, Health Sciences, and Education Disciplines, 2013, 2018, 2023, and CAGR

Master's Degree	2013	2018	2023	10-Year CAGR	5-Year CAGR
S&E	**399**	**541**	**594**	**4.1%**	**1.9%**
Sciences	**280**	**377**	**451**	**4.9%**	**3.6%**
Computer sciences	61	146	187	11.9%	5.1%
Psychology	68	60	54	-2.3%	-2.1%
Social sciences	53	51	35	-4.1%	-7.3%
Agricultural sciences	22	50	37	5.3%	-5.8%
Physical sciences	26	29	38	3.9%	5.6%
Biological sciences	36	26	51	3.5%	14.4%
Mathematics and statistics	14	15	49	13.3%	26.7%
Engineering	**119**	**164**	**143**	**1.9%**	**-2.7%**
Civil engineering	32	43	22	-3.7%	-12.5%
Industrial engineering	19	31	26	3.2%	-3.5%
Electrical engineering	21	23	26	2.2%	2.5%
Mechanical engineering	11	16	19	5.6%	3.5%
Chemical engineering	7	11	2	-11.8%	-28.9%
Biomedical engineering	5	7	12		11.4%
Materials engineering	7	6	11	4.6%	12.9%
Other engineering	17	27	25	3.9%	-1.5%
Health Science	**177**	**239**	**261**	**4.0%**	**1.8%**
Education	**360**	**482**	**456**	**2.4%**	**-1.1%**

Source: National Center of Education Statistics (2024). Integrated Postsecondary Education Data System (IPEDS) Completions Survey, multiple years.

Figure 11

The number of S&E PhDs awarded by South Dakota universities grew by 4.2% per year over the past 10 years (from 62 degrees in 2013 to 94 degrees in 2023) but fell by 2.2% per year over the past 5 years. Education PhDs awarded declined over the past 10 years, but the rate of decline slowed considerably in the past 5 years. Health Sciences PhDs awarded grew the most over both periods.

South Dakota Doctoral Degrees Awarded in S&E, Health Sciences, and Education Disciplines, 2013, 2018, 2023, and CAGR

Doctoral Degree	2013	2018	2023	10-Year CAGR	5-Year CAGR
S&E	**62**	**105**	**94**	**4.2%**	**-2.2%**
Sciences	**48**	**80**	**71**	**4.0%**	**-2.4%**
Psychology	6	12	16	10.3%	5.9%
agricultural sciences	8	12	15	6.5%	4.6%
physical sciences	5	10	15	11.6%	8.4%
computer sciences	4	7	11	10.6%	9.5%
biological sciences	22	19	10	-7.6%	-12.0%
social sciences	1	10	4	14.9%	-16.7%
mathematics and statistics	2	10	0	-100.0%	-100.0%
Engineering	**14**	**25**	**23**	**5.1%**	**-1.7%**
Biomedical engineering	1	4	7	21.5%	11.8%
Mechanical engineering	0	4	4	NA	0.0%
Chemical engineering	0	0	4	NA	NA
Materials engineering	1	4	2	7.2%	-12.9%
Civil engineering	0	2	2	NA	0.0%
Electrical engineering	5	1	1	-14.9%	0.0%
Other engineering	7	10	3	-8.1%	-21.4%
Health Science	**7**	**15**	**22**	**12.1%**	**8.0%**
Education	**37**	**29**	**27**	**-3.1%**	**-1.4%**

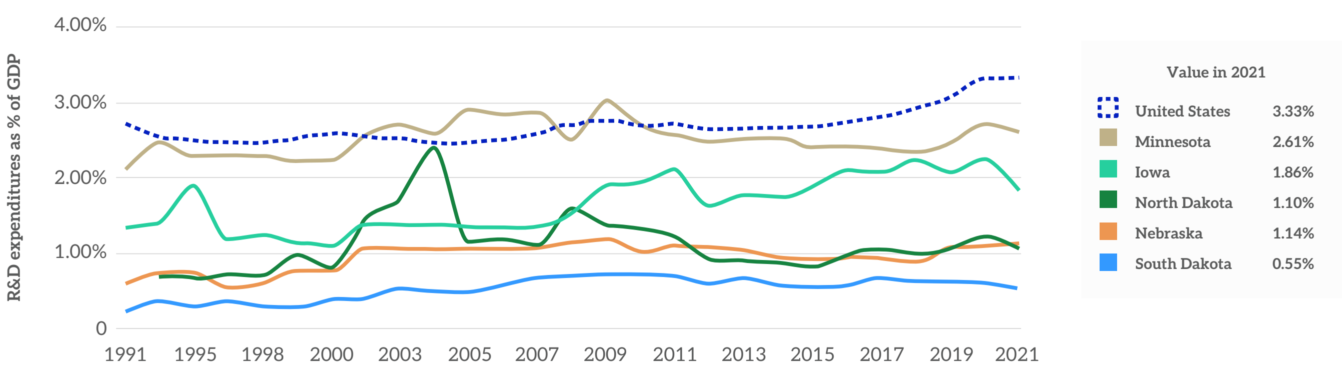
Source: National Center of Education Statistics (2024). Integrated Postsecondary Education Data System (IPEDS) Completions Survey, multiple years.

Research Competitiveness

Figure 12

Companies, universities, government, and nonprofit research organizations perform R&D. The higher the R&D intensity (defined as total R&D expenditures relative to gross domestic product [GDP]), the more technology-intensive an economy is. The Organization for Economic Cooperation and Development (OECD) member country's average R&D intensity is 2.67%. The U.S. R&D intensity is higher at 3.33%. South Dakota's R&D Intensity was 0.55% in 2021. This is significantly lower than the R&D intensity of neighboring states, Minnesota (2.61%), Iowa (1.86%), Nebraska (1.14%), and North Dakota (1.10%).

Comparison of U.S., South Dakota, and Select Neighboring State R&D Intensity (Gross Expenditures on R&D as a Share of GDP), 1991–2021

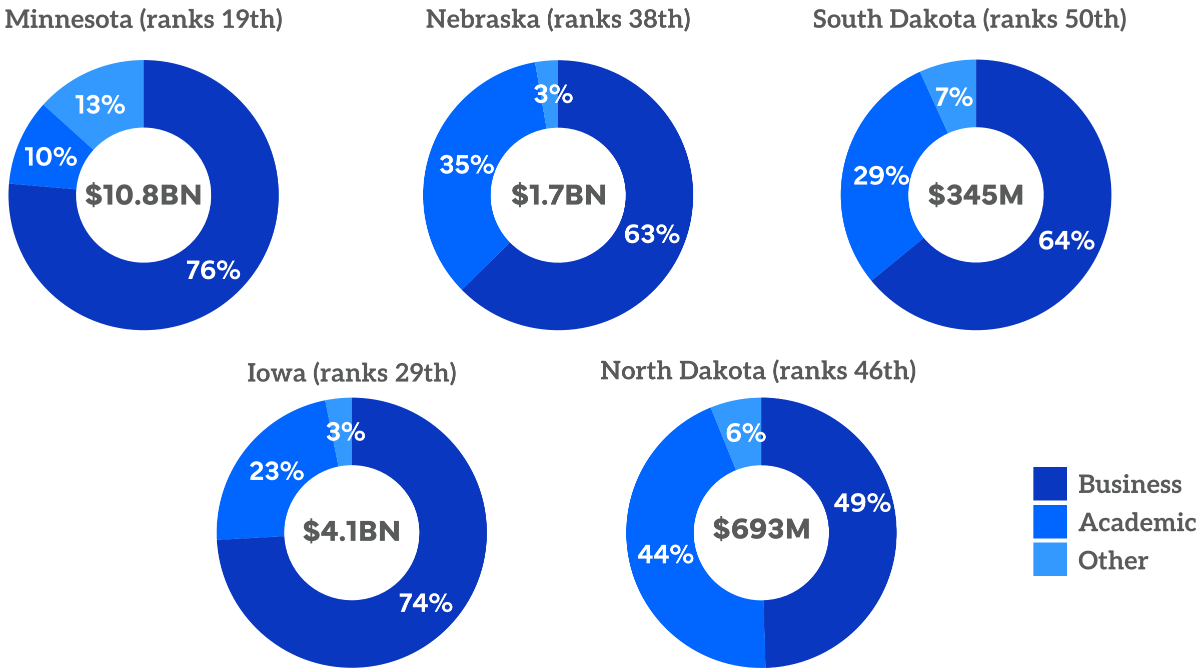


Source: National Science Board (2023). State Science and Engineering Indicators.

Figure 13

In the U.S., companies perform more than three-quarters (78%) of R&D, academia performs roughly 10%, federal labs 8%, and nonprofit research organizations 3%. At the state level, the share of R&D that each sector represents varies substantially. For example, business accounted for 76% of Minnesota's total R&D expenditures of $10.8 billion in 2021, 63% of Nebraska's total $1.7 billion of R&D expenditures, and 64% of South Dakota's total $345 million of R&D expenditures.

Total R&D Expenditures by Performing Sector in South Dakota and Neighboring States, 2021



Source: National Science Board (2023). National Patterns of R&D Resources.

Figure 14

South Dakota ranks 23rd among EPSCoR states for total business R&D expenditures. In 2022, South Dakota companies reported $201 million of business R&D expenditures which is from the same as in 2018. By comparison, the average growth in business R&D expenditures across all EPSCoR states was 4.1% per year from 2018-2022.

Total Business R&D Expenditures and CAGR in EPSCoR States and Territories, 2013, 2018, and 2022

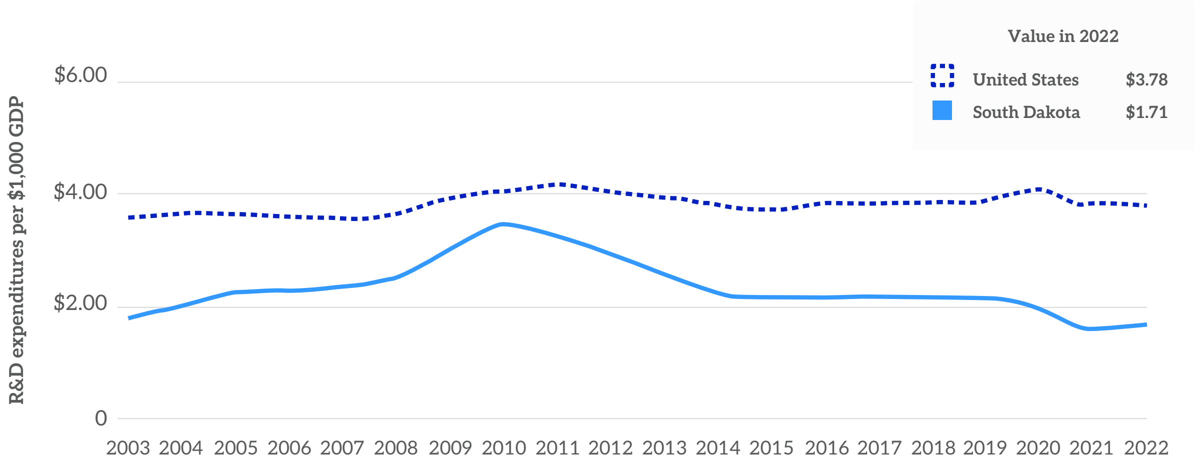
State	Rank	Total Business R&D Expenditures ($M)			CAGR (%)	
	2023	2013	2018	2022	10-year	4-year
Iowa	1	$2,052	$3,315	$3,257	4.7%	-0.4%
Idaho	2	$1,238	$2,556	$2,883	8.8%	3.1%
Delaware	3	$2,310	$2,375	$2,874	2.2%	4.9%
South Carolina	4	$1,016	$1,670	$2,319	8.6%	8.6%
Alabama	5	$1,563	$2,236	$2,259	3.8%	0.3%
Kansas	6	$1,942	$2,593	$2,219	1.3%	-3.8%
Oklahoma	7	$505	$868	$1,820	13.7%	20.3%
New Mexico	8	$519	$699	$1,514	11.3%	21.3%
Nevada	9	$525	$960	$1,471	10.9%	11.3%
New Hampshire	10	$2,045	$2,566	$1,449	-3.4%	-13.3%
Nebraska	11	$627	$570	$1,395	8.3%	25.1%
Kentucky	12	$1,279	$1,435	$925	-3.2%	-10.4%
Vermont	14	$406	$300	$614	4.2%	19.6%
Maine	13	$365	$285	$597	5.0%	20.3%
Rhode Island	15	$571	$703	$594	0.4%	-4.1%
Arkansas	16	$288	$471	$545	6.6%	3.7%
Louisiana	18	$354	$415	$530	4.1%	6.3%
North Dakota	17	$229	$312	$454	7.1%	9.8%
Hawaii	19	$214	$146	$447	7.6%	32.3%
West Virginia	20	$306	$238	$444	3.8%	16.9%
Mississippi	21	$211	$276	$442	7.7%	12.5%
Montana	22	$92	$180	$376	15.1%	20.2%
South Dakota	**23**	**$164**	**$201**	**$201**	**2.1%**	**0.0%**
Alaska	24	$46	$25	$189	15.2%	65.8%
Wyoming	25	$28	$39	$78	10.8%	18.9%
Total EPSCoR		**$18,895**	**$25,434**	**$29,896**	**4.7%**	**4.1%**

Source: National Center for Science and Engineering Statistics (2024). Business Research and Development Survey, multiple years.

Figure 15

South Dakota's academic R&D expenditures have not kept pace with GDP growth. Over the past 10 years, South Dakota's academic R&D expenditures per $1,000 of GDP declined from $2.94 in 2012 to $1.71 in 2022. U.S. academic R&D expenditures relative to the size of the U.S. economy have also declined slightly to $3.78, but South Dakota is still significantly below the national average.

South Dakota and U.S. Academic R&D per $1,000 of GDP, 2003–2022



Source: National Science Board (2023). State Science and Engineering Indicators.

Figure 16

Academic R&D expenditures come from a variety of sources: federal, state, institutional, industry, and nonprofit organizations. The CAGR in total academic R&D expenditures drives a state's ranking. Compared to the other EPSCoR states and territories, South Dakota ranks lower (25th out of 28), because its past 10- and 5-year growth rates have been slower.

Total Academic R&D Expenditures and CAGR in EPSCoR States and Territories, 2013, 2018, and 2023

State	Rank	Total R&D Expenditures ($M)			CAGR (%)	
	2023	2013	2018	2023	10-year	5-year
Alabama	1	$837.9	$1,052.5	$1,579.5	6.5%	8.5%
Iowa	2	$714.4	$885.9	$1,102.5	4.4%	4.5%
Louisiana	3	$671.6	$744.3	$1,064.4	4.7%	7.4%
Kansas	4	$545.4	$640.7	$1,054.0	6.8%	10.5%
South Carolina	5	$648.1	$736.3	$919.0	3.6%	4.5%
Kentucky	6	$550.9	$596.5	$756.5	3.2%	4.9%
Oklahoma	7	$420.1	$517.3	$725.0	5.6%	7.0%
Nebraska	8	$444.9	$535.9	$680.3	4.3%	4.9%
Mississippi	9	$416.8	$479.4	$608.2	3.9%	4.9%
New Hampshire	10	$354.3	$471.3	$590.5	5.2%	4.6%
New Mexico	11	$403.8	$369.9	$564.6	3.4%	8.8%
Rhode Island	12	$479.2	$369.8	$513.8	0.7%	6.8%
Delaware	14	$197.3	$207.6	$461.6	8.9%	17.3%
Arkansas	13	$294.6	$343.1	$457.8	4.5%	5.9%
Montana	15	$186.0	$230.1	$382.0	7.5%	10.7%
North Dakota	16	$219.1	$255.5	$373.9	5.5%	7.9%
Hawaii	18	$343.8	$298.0	$339.7	-0.1%	2.7%
Nevada	17	$153.4	$260.1	$325.8	7.8%	4.6%
West Virginia	19	$196.5	$211.7	$286.6	3.8%	6.2%
Alaska	20	$184.5	$165.2	$241.5	2.7%	7.9%
Vermont	21	$121.1	$131.7	$238.4	7.0%	12.6%
Maine	22	$104.6	$128.5	$211.3	7.3%	10.5%
Idaho	23	$143.7	$171.1	$206.4	3.7%	3.8%
Wyoming	24	$65.5	$113.1	$150.1	8.6%	5.8%
South Dakota	**25**	**$117.4**	**$115.9**	**$129.0**	**1.0%**	**2.2%**
Puerto Rico	26	$135.7	$103.9	$115.7	-1.6%	2.2%
Guam	27	$6.0	$11.2	$22.4	14.0%	14.8%
Virgin Islands	28	$20.0	$12.0	$20.3	0.1%	11.1%
Total EPSCoR		**$8,976.4**	**$10,158.4**	**$14,120.9**	**4.6%**	**6.8%**

Note: The National Science Foundation's EPSCoR program supports states and territories that received 0.75% or less of total NSF research funding over the most recent 3-year period. The data presented for each state and territory include all public, private, and Tribal colleges that respond to the Higher Education R&D Survey.

Source: National Center for Science and Engineering Statistics (2024). Higher Education R&D Survey, multiple years.

Figure 17

In 2023, South Dakota's federally supported academic R&D expenditures totaled $62.0 million, down slightly from $62.2 million in 2013, representing a -0.04% CAGR. Over the past 5 years, federally supported R&D expenditures grew 2.2% per year.

Total Federally Supported Academic R&D Expenditures in EPSCoR States and Territories, FY2013, FY2018, and FY2023

State	Rank	Total R&D Expenditures ($M)			CAGR (%)	
	2023	2013	2018	2023	10-year	5-year
Alabama	1	$516.0	$579.4	$852.7	5.2%	8.0%
Iowa	2	$382.6	$398.9	$534.3	3.4%	6.0%
Louisiana	3	$298.5	$290.0	$460.6	4.4%	9.7%
South Carolina	4	$302.8	$333.7	$447.2	4.0%	6.0%
Kansas	5	$259.3	$254.5	$437.7	5.4%	11.5%
Kentucky	6	$242.7	$265.9	$384.4	4.7%	7.7%
New Mexico	7	$269.2	$244.3	$381.4	3.6%	9.3%
Rhode Island	8	$215.8	$238.5	$355.5	5.1%	8.3%
New Hampshire	9	$261.6	$237.0	$321.1	2.1%	6.3%
Nebraska	10	$201.4	$225.8	$316.6	4.6%	7.0%
Mississippi	11	$208.0	$212.5	$314.4	4.2%	8.2%
Oklahoma	12	$187.9	$208.6	$306.3	5.0%	8.0%
Montana	13	$112.8	$136.7	$228.0	7.3%	10.8%
Delaware	14	$131.6	$131.6	$226.6	5.6%	11.5%
Hawaii	15	$241.6	$186.5	$215.6	-1.1%	2.9%
Arkansas	16	$115.1	$125.5	$193.3	5.3%	9.0%
Alaska	17	$105.8	$110.7	$171.4	5.0%	9.2%
Nevada	18	$104.2	$114.3	$144.2	3.3%	4.8%
West Virginia	19	$95.0	$90.5	$137.8	3.8%	8.8%
Vermont	20	$89.2	$90.0	$132.6	4.1%	8.1%
North Dakota	21	$84.9	$86.2	$120.6	3.6%	7.0%
Maine	22	$48.8	$57.9	$106.9	8.2%	13.1%
Idaho	23	$83.3	$86.2	$106.6	2.5%	4.3%
Puerto Rico	24	$87.2	$70.0	$83.2	-0.5%	3.5%
Wyoming	25	$54.0	$42.6	$68.5	2.4%	10.0%
South Dakota	**26**	**$62.2**	**$55.6**	**$62.0**	**-0.04%**	**2.2%**
Virgin Islands	27	$15.6	$10.9	$19.1	2.0%	12.0%
Guam	28	$5.6	$8.6	$19.0	13.1%	17.2%
Total EPSCoR		$4,782.7	$4,892.6	$7,147.7	4.1%	7.9%

Note: The National Science Foundation's EPSCoR program supports states and territories that received 0.75% or less of total NSF research funding over the most recent 3-year period. The data presented for each state and territory include all public, private, and Tribal colleges that respond to the Higher Education R&D Survey.

Source: National Center for Science and Engineering Statistics (2024). Higher Education R&D Survey, multiple years.

Figure 18

In 2023, the Department of Health and Human Services ($16.7 million), followed by USDA ($15.4 million), and NSF ($14.6 million) were the top federal funders of South Dakota academic R&D. Over the past decade, South Dakota experienced the largest declines in the DOE (-8.8% per year) and NASA (-7.6% per year) funding.

South Dakota Federally Supported Academic R&D Expenditures ($M) and Compound Annual Growth Rates by Federal Agency, FY 2013-2023

Federal Agency	R&D Expenditures ($M)											CAGR (%)	
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	10-year	5-year
DHHS (Including NIH)	$13.6	$9.3	$8.0	$8.9	$12.7	$13.4	$13.0	$12.4	$12.6	$15.7	$16.7	2.0%	4.5%
USDA	$9.2	$8.2	$8.6	$9.1	$9.4	$11.2	$14.9	$11.6	$7.7	$9.6	$15.5	5.4%	6.7%
NSF	$15.4	$15.4	$14.5	$15.5	$13.8	$14.7	$16.6	$13.5	$13.2	$16.6	$14.6	-0.5%	-0.1%
DOD	$6.1	$3.3	$4.3	$4.6	$5.3	$5.4	$3.7	$4.1	$5.2	$7.4	$6.0	-0.1%	2.3%
Other federal agency	$5.4	$6.0	$5.9	$5.4	$5.3	$4.6	$4.5	$5.6	$3.6	$4.6	$3.9	-3.2%	-3.1%
DOE	$7.5	$4.9	$3.3	$3.5	$2.2	$1.5	$1.8	$2.3	$2.6	$2.6	$3.0	-8.8%	15.3%
NASA	$5.1	$5.5	$5.6	$5.5	$5.6	$4.9	$3.1	$2.0	$1.7	$1.8	$2.3	-7.6%	-14.0%
Total	**$62.2**	**$52.6**	**$50.3**	**$52.5**	**$54.4**	**$55.6**	**$57.7**	**$51.5**	**$46.6**	**$58.2**	**$62.0**	**-0.04%**	**2.2%**

Notes: DHHS = Department of Health and Human Services; NIH = National Institutes of Health; USDA = U.S. Department of Agriculture; NSF = National Science Foundation; DOE = Department of Energy; NASA = N NASA. South Dakota institutions that completed the long-form Higher Education R&D Survey that provides this level of detail include Augustana University, Black Hills State University, Dakota State University, South Dakota School of Mines and Technology, South Dakota State University, and the University of South Dakota.

Source: National Center for Science and Engineering Statistics (2024). Higher Education R&D Survey, multiple years.

Figure 19

Life sciences received the most federal R&D funding in 2023, totaling $30.8 million, followed by engineering ($15.6 million), and the physical sciences ($8.2 million). Over the past 5 years, most S&E fields experienced growth, except for computer and information sciences (-3.0% per year); geosciences, atmospheric, and ocean sciences (-20.8% per year); and social sciences (-0.9% per year).

South Dakota Federally Supported Academic R&D Expenditures ($M) and CAGRs by S&E Field, FY2013-2023

S&E Field	R&D Expenditures ($M)											CAGR (%)	
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	10-year	5-year
Life sciences	$32.4	$28.7	$26.0	$26.7	$28.4	$29.9	$33.5	$27.2	$20.9	$26.9	$30.8	-0.5%	0.6%
Engineering	$12.2	$9.6	$9.8	$12.8	$13.0	$12.5	$11.8	$12.0	$14.4	$18.4	$15.6	2.5%	4.4%
Physical sciences	$6.9	$5.3	$4.0	$4.3	$4.4	$4.5	$5.7	$4.5	$5.3	$5.9	$8.2	1.8%	12.9%
Computer and information sciences	$1.0	$1.1	$1.3	$1.5	$2.0	$3.8	$3.1	$5.1	$2.9	$4.5	$3.2	11.9%	-3.0%
Psychology	$0.2	$0.5	$0.5	$0.4	$0.1	$0.1	$0.2	$0.2	$1.0	$0.8	$1.1	19.8%	49.8%
Non-S&E fields	$1.3	$1.4	$2.0	$1.1	$1.0	$1.0	$0.9	$0.3	$0.3	$0.5	$1.0	-2.9%	0.6%
Geosciences, atmospheric, and ocean sciences	$4.0	$4.2	$5.1	$4.7	$4.7	$3.0	$1.5	$0.6	$0.6	$0.7	$0.9	-13.4%	-20.8%
Mathematics and statistics	$0.4	$0.2	$0.2	$0.4	$0.4	$0.4	$0.4	$0.6	$0.5	$0.6	$0.7	5.8%	12.0%
Social sciences	$3.9	$1.6	$1.5	$0.5	$0.4	$0.5	$0.6	$0.9	$0.7	$0.8	$0.5	-19.4%	-0.9%
Total by Year	**$62.2**	**$52.6**	**$50.3**	**$52.5**	**$54.3**	**$55.6**	**$57.7**	**$51.5**	**$46.6**	**$58.2**	**$62.0**	**-0.04%**	**2.2%**

Note: South Dakota institutions that completed the long-form Higher Education R&D Survey that provides this level of detail include Augustana University, Black Hills State University, Dakota State University, South Dakota School of Mines and Technology, South Dakota State University, and the University of South Dakota.

Source: National Center for Science and Engineering Statistics (2024). Higher Education R&D Survey, multiple years.

Figure 20

Within life sciences, agricultural sciences and biological and biomedical sciences are the largest subfields. Agricultural sciences R&D grew by 11.2% per year over the past five years, while biological and biomedical sciences fell by 0.1% per year. Health sciences R&D declined by -4.3% per year, and natural resources and conservation R&D grew by 1.4% per year.

South Dakota Federally Supported Life Sciences R&D Expenditures ($M) and CAGRs by Detailed Field, FY 2013-2023

Life Sciences Subfield	R&D Expenditures ($M)											CAGR (%)	
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	10-year	5-year
Agricultural sciences	$13.0	$11.7	$11.6	$7.7	$6.7	$8.2	$11.5	$10.0	$6.8	$8.9	$14.0	0.8%	11.2%
Biological and biomedical sciences	$13.2	$10.2	$8.0	$7.8	$10.4	$11.8	$11.7	$11.7	$9.8	$12.4	$11.7	-1.2%	-0.1%
Health sciences	$1.3	$0.8	$1.3	$3.0	$3.4	$3.2	$2.8	$2.1	$2.6	$2.9	$2.6	6.8%	-4.3%
Natural resources and conservation	-	-	-	$2.9	$2.6	$2.2	$2.4	$2.0	$1.3	$1.8	$2.4	NA	1.4%
Other life sciences	$4.9	$6.1	$5.2	$5.2	$5.3	$4.4	$5.2	$1.5	$0.5	$0.1	$0.1	-30.8%	-51.1%
Total	**$32.4**	**$28.7**	**$26.0**	**$26.7**	**$28.4**	**$29.9**	**$33.5**	**$27.2**	**$20.9**	**$25.9**	**$30.8**	**-0.5%**	**0.6%**

Note: South Dakota institutions that completed the long-form Higher Education R&D Survey that provides this level of detail include Augustana University, Black Hills State University, Dakota State University, South Dakota School of Mines and Technology, South Dakota State University, and the University of South Dakota. Where data are $0.00, R&D expenditures are in the low thousands.

Source: National Center for Science and Engineering Statistics (2024). Higher Education R&D Survey, multiple years.

Figure 21

Engineering is the second-largest field for federally supported R&D expenditures in South Dakota. Most engineering subfields R&D grew over the past 5 years. Chemical, metallurgical, other engineering, and civil are the largest subfields in engineering. Biomedical engineering R&D has expanded rapidly in the past 5 years, along with metallurgical and mechanical engineering.

South Dakota Federally Supported Engineering R&D Expenditures ($M) and CAGR by Detailed Field, FY 2013-2023

Engineering Subfield	R&D Expenditures ($M)											CAGR (%)	
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	10-year	5-year
Chemical engineering	$1.0	$0.3	$1.3	$2.7	$2.6	$2.8	$2.1	$3.3	$4.7	$4.7	$3.5	13.2%	4.8%
Metallurgical and materials engineering	$1.9	$2.4	$2.1	$1.4	$1.0	$1.0	$1.5	$2.0	$2.2	$4.3	$3.4	5.8%	27.3%
Other engineering	$5.7	$4.6	$3.6	$5.3	$4.4	$4.3	$4.0	$3.0	$3.4	$4.3	$3.0	-6.2%	-7.0%
Civil engineering	$0.9	$0.9	$1.3	$1.1	$2.0	$2.0	$1.6	$1.4	$1.5	$2.0	$2.0	NA	-0.1%
Mechanical engineering	$1.1	$0.5	$0.3	$0.7	$1.2	$0.6	$0.5	$0.7	$0.7	$1.0	$1.6	3.9%	20.5%
Biomedical engineering	$0.2	$0.0	$0.2	$0.5	$0.6	$0.7	$1.3	$0.4	$1.0	$0.9	$1.5	21.3%	17.9%
Electrical engineering	$1.3	$0.8	$0.9	$0.9	$1.3	$1.1	$0.9	$1.1	$1.0	$1.0	$0.5	-8.4%	-13.6%
Industrial engineering	-	-	-	$0.2	$0.0	$0.0	$0.0	-	$0.0	$0.0	$0.0	NA	14.9%
Aerospace engineering	-	-	-	-	-	-	-	-	-	$0.1	-	NA	NA
Total	**$12.2**	**$9.6**	**$9.8**	**$12.8**	**$13.0**	**$12.5**	**$11.8**	**$12.0**	**$14.4**	**$18.4**	**$15.6**	**2.5%**	**4.5%**

Note: South Dakota institutions that completed the long-form Higher Education R&D Survey that provides this level of detail include Augustana University, Black Hills State University, Dakota State University, South Dakota School of Mines and Technology, South Dakota State University, and the University of South Dakota. Where data are $0.0, R&D expenditures are in the low thousands.

Source: National Center for Science and Engineering Statistics (2024). Higher Education R&D Survey, multiple years.

Figure 22

In South Dakota, chemistry ($4.8 million) and physics ($3.3 million) are the top two physical sciences subfields for federally supported R&D. Both have expanded over the past 5 years. Since 2018, chemistry R&D has grown by 14.6% per year and physics R&D has grown by 10.6% per year.

Total Federally Supported Academic R&D Expenditures ($M) by Physical Science Subfields, FY 2013-2023

Federal Agency	R&D Expenditures ($M)											CAGR (%)	
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	10-year	5-year
Chemistry	$5.1	$4.3	$3.2	$2.8	$2.7	$2.5	$2.6	$2.7	$2.9	$2.9	$4.9	-0.5%	14.6%
Physics	$1.7	$1.0	$0.8	$1.5	$1.7	$2.0	$2.9	$1.8	$2.4	$3.0	$3.3	6.7%	10.6%
Astronomy and astrophysics	-	-	-	-	$0.0	-	-	-	-	-	-	NA	NA
Other physical sciences	-	-	-	-	-	-	$0.2	-	$0.0	-	-	NA	NA
Total	**$6.9**	**$5.3**	**$4.0**	**$4.3**	**$4.4**	**$4.5**	**$5.7**	**$4.5**	**$5.3**	**$5.9**	**$8.2**	**1.8%**	**12.9%**

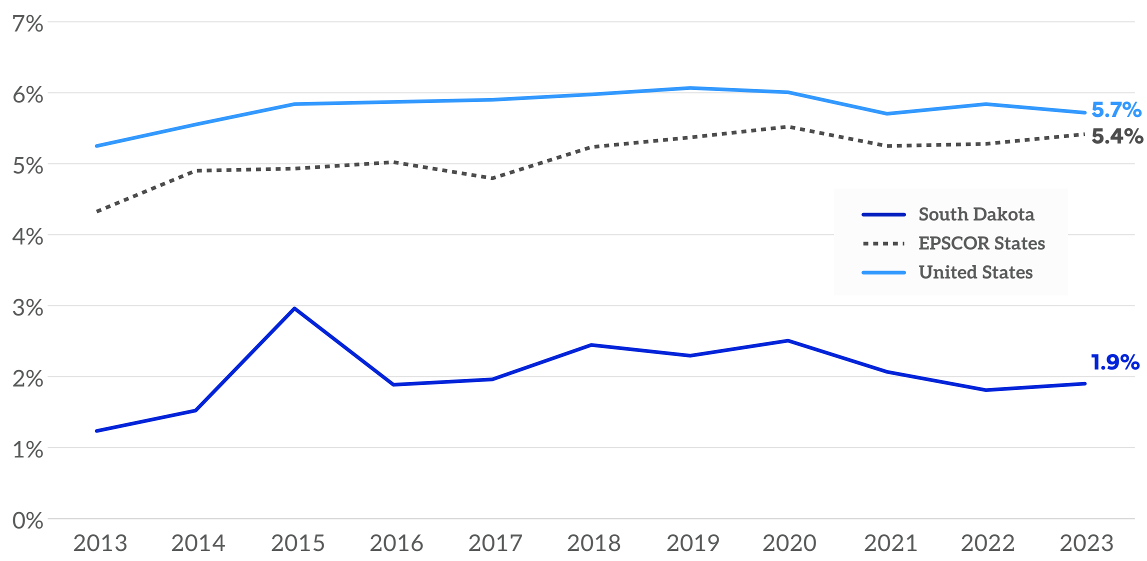
Note: South Dakota institutions that completed the long-form Higher Education R&D Survey that provides this level of detail include Augustana University, Black Hills State University, Dakota State University, South Dakota School of Mines and Technology, South Dakota State University, and the University of South Dakota. Where data are $0.0, R&D expenditures are in the low thousands.

Source: National Center for Science and Engineering Statistics (2024). Higher Education R&D Survey, multiple years.

Figure 23

Industry-sponsored R&D represents 1.9% of South Dakota's total academic R&D expenditures, compared to 5.4% for all EPSCoR states and territories and 5.7% nationally. Over the past 10 years, industry-sponsored R&D in South Dakota has grown more slowly compared to the EPSCoR and U.S. average CAGR.

Share of Industry-Sponsored R&D Expenditures as Percentage of Total Academic R&D Expenditures in South Dakota, EPSCoR States, and the U.S., 2013-2023



Notes: The National Science Foundation EPSCoR program supports states and territories that received 0.75% or less of total NSF research funding over the most recent 3-year period.

Source: National Center for Science and Engineering Statistics (2024). Higher Education R&D Survey, multiple years.

Compound Annual Growth Rate in South Dakota Industry-Sponsored R&D Expenditures Compared to EPSCoR and U.S. Averages, 2013-2023 and 2018-2023

Location	Industry-Sponsored R&D Expenditures ($M)			CAGR (%)	
	2013	2018	2023	10-year	5-year
South Dakota	$1.5	$2.8	$2.5	5.4%	-2.9%
All EPSCoR institutions	$366.7	$493.8	$714.4	6.9%	7.7%
All U.S. institutions	$3,510.5	$4,721.2	$6,221.1	5.9%	5.7%
	% of Total Academic R&D Expenditures				
South Dakota	1.2%	2.4%	1.9%	4.4%	-4.9%
All EPSCoR Institutions	4.3%	5.2%	5.4%	2.3%	0.6%
All U.S. Institutions	5.2%	6.0%	5.7%	0.9%	-0.9%

Notes: The National Science Foundation EPSCoR program supports states and territories that received 0.75% or less of total NSF research funding over the most recent 3-year period.

Source: National Center for Science and Engineering Statistics (2024). Higher Education R&D Survey, multiple years.

Figure 24

Industry-sponsored R&D totaled $2.45 million in 2023. South Dakota State University reported the largest amount of industry-sponsored academic R&D expenditures, totaling $1.43 million, followed by Dakota State University and South Dakota Mines.

South Dakota Industry-Sponsored Academic R&D Expenditures ($M) and Compound Annual Growth Rate by Institution, 2013-2023

University	Year											CAGR (%)	
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	10-year	5-year
South Dakota State U.	$1.09	$0.98	$1.18	$0.94	$1.18	$1.90	$1.96	$1.88	$1.30	$1.28	$1.43	2.8%	-5.5%
Dakota State U.	$0.04	$0.13	$0.12	-	$0.06	-	$0.03	$0.19	$0.20	$0.08	$0.69	34.0%	NA
South Dakota Mines	$0.17	$0.26	$1.65	$1.07	$0.97	$0.83	$0.68	$0.70	$0.57	$0.74	$0.29	5.6%	-19.2%
U. South Dakota	$0.02	$0.07	$0.00	-	-	$0.11	$0.05	-	-	$0.03	$0.04	10.6%	-16.1%
Augustana U.	$0.14	$0.17	$0.10	-	-	-	-	-	-	-	-	NA	NA
Black Hills State U.		$0.00	$0.03	$0.01	$0.01	-	-	-	-	-	-	NA	NA
Total	**$1.45**	**$1.61**	**$3.07**	**$2.02**	**$2.22**	**$2.84**	**$2.72**	**$2.77**	**$2.07**	**$2.14**	**$2.45**	**5.4%**	**-2.9%**

Note: R&D expenditures is only reported by universities completing the long-form Higher Education R&D Survey. This table is ranked industry-sponsored R&D expenditures in South Dakota in 2023. Where data are $0.00, R&D expenditures are in the low thousands.

Source: National Center for Science and Engineering Statistics (2024). Higher Education R&D Survey, multiple years.

Figure 25

Industry-sponsored R&D in South Dakota was highest in the life sciences, followed by computer and information sciences, and engineering in 2023. Over the past 5 years, industry-sponsored R&D declined in the life sciences and engineering but increased in computer and information sciences.

South Dakota Industry-Sponsored Academic R&D Expenditures ($M) by Field by Value and CAGR, 2013-2023

Field	Year											CAGR %	
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	10-year	5-year
Life sciences	$1.12	$1.02	$1.09	$0.79	$1.03	$1.76	$1.73	$1.61	$1.08	$1.21	$1.29	1.5%	-6.1%
Computer and information sciences	$0.04	$0.03	$0.04	-	-	-	$0.03	$0.17	$0.20	$0.08	$0.69	34.0%	NA
Engineering	$0.28	$0.39	$1.09	$1.04	$1.08	$0.95	$0.78	$0.84	$0.70	$0.79	$0.34	1.9%	-18.7%
Mathematics and statistics	-	-	$0.03	-	$0.01	$0.06	$0.11	$0.11	$0.09	$0.05	$0.11	NA	11.2%
Non-S&E fields	$0.00	$0.00	-	-	-	$0.01	$0.05	-	-	-	$0.03	38.5%	39.1%
Geosciences, atmospheric, and ocean sciences	-	-	-	-	-	-	-	$0.02	$0.01		-	NA	NA
Social sciences	$0.01	$0.02	$0.02	-	-	-	-	-	-	-	-	NA	NA
Physical sciences	$0.01	$0.15	$0.80	$0.19	$0.10	$0.06	$0.02	$0.01	$0.00	$0.01	-	NA	NA
Total	**$1.45**	**$1.61**	**$3.07**	**$2.02**	**$2.22**	**$2.84**	**$2.72**	**$2.77**	**$2.07**	**$2.14**	**$2.45**	**5.4%**	**-2.9%**

Note: R&D expenditures is only reported by universities completing the long-form Higher Education R&D Survey. This includes Augustana University, Black Hills State University, Dakota State University, South Dakota School of Mines and Technology, and South Dakota State University. This table is ranked by total academic R&D expenditure of South Dakota in 2023. Where data are $0.00, R&D expenditures are in the low thousands.

Source: National Center for Science and Engineering Statistics (2024). Higher Education R&D Survey, multiple years.

Commercialization and Innovation

Figure 26

Technology transfer is the process by which universities protect intellectual property arising from scientific discoveries and technology development and market and license them to companies interested in bringing the technologies to market. In South Dakota, performance on all tech transfer indicators, except patents awarded, has decreased since 2015.

South Dakota System Tech Transfer Statistics, FY2015–2024

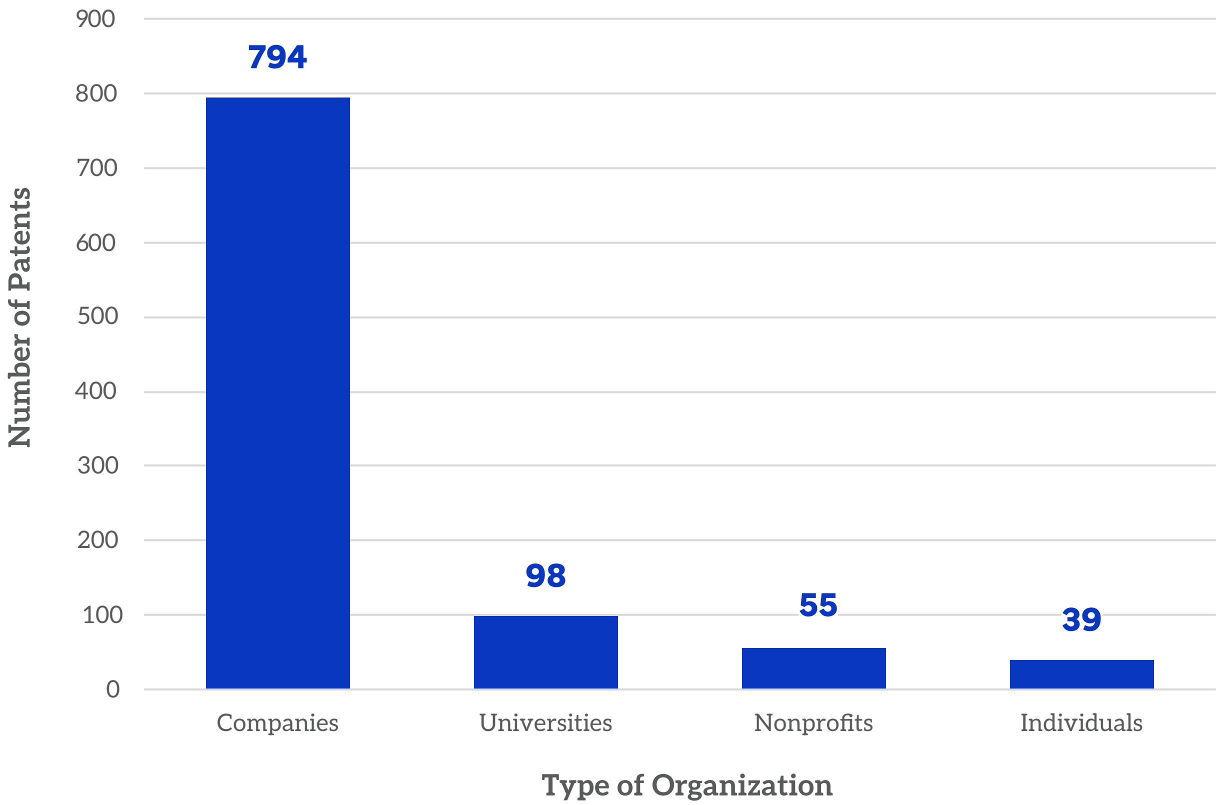
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Invention disclosures	56	52	73	44	38	39	34	43	29	34
Patents and other intellectual property filings	30	39	25	26	17	17	21	21	16	15
Patents awarded	9	9	11	14	7	16	9	18	12	17
License agreements with startups	4	3	6	3	1	3	5	0	0	2
All license agreements	16	13	9	12	5	6	9	6	3	2

Source: South Dakota Board of Regents.

Figure 27

Over the past 10 years, South Dakota companies were awarded approximately 72 patents per year, totaling 794 patents. Universities generated the second-largest number of patents, an average of nine per year, totaling 98 patents. Nonprofit organizations and individual inventors generate the third- and fourth-most patents, averaging 5 patents per year, and 4 patents per year, respectively.

Total Number of South Dakota Patents Granted by Type of Organization, 2013-2023



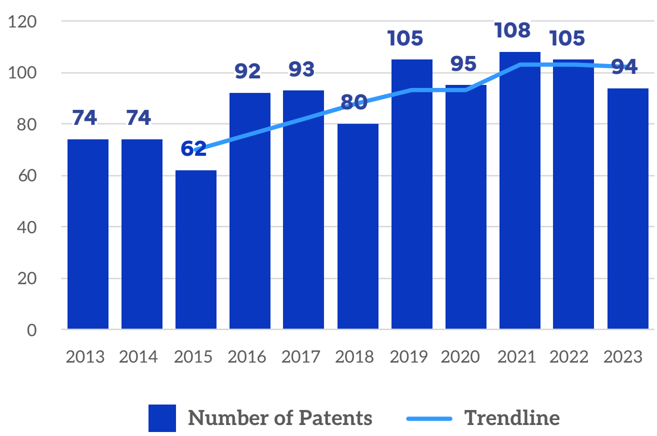
Notes: One unique patent can have multiple types of organizations associated with it. The sum of awards by category is greater than the total number of patents awarded.

Source: U.S. Patents and Trademark Organization (2024). PatentsView.

Figure 28

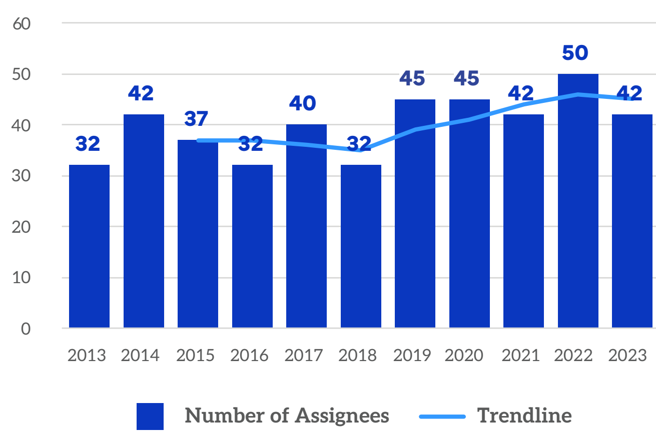
Based on 3-year rolling averages, both patenting activity and the number of unique assignees in South Dakota have grown over the past 10 years. In 2023, 42 unique assignees produced 94 patents. Over the past 10 years, 2021 was the peak for number of patents granted with 108 patents, and 2022 was the peak for number of unique assignees with 50 South Dakota companies, organizations, and individual inventors awarded one or more patents.

Total Number of South Dakota Patents Granted, 2013–2023



Source: U.S. Patents and Trademark Organization, PatentsView, multiple years.

Total Number of South Dakota Unique Patent Assignees, 2013–2023

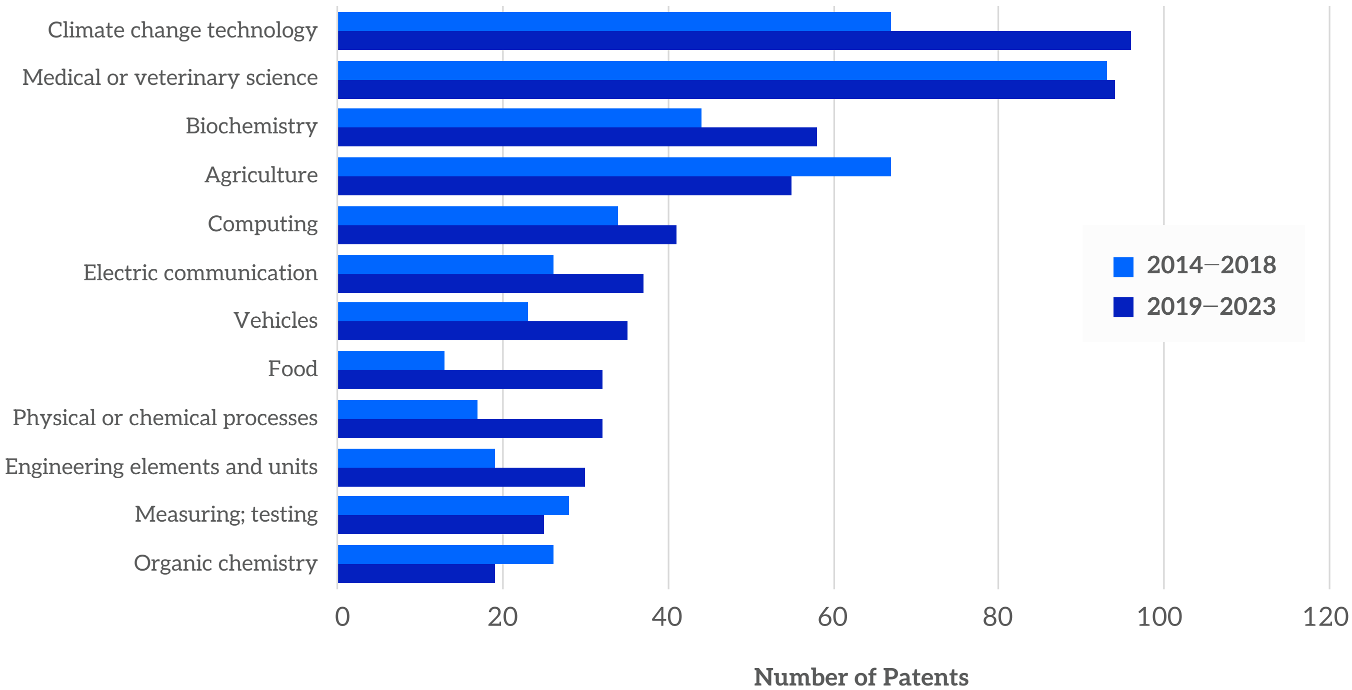


Source: U.S. Patents and Trademark Organization (2024). PatentsView, multiple years.

Figure 29

Climate change technology, medical or veterinary science, and biochemistry were South Dakota's top fields for patenting (2019–2023). Between the two 5-year periods in this figure, patenting in all technology categories except agriculture, measuring and testing, and organic chemistry increased.

Top 10 South Dakota Patents Granted by Category, 2014-2018 and 2019-2023



Notes: One patent can be included in more than one cooperative patent classification (CPC) code. Consequently, the sum of patents awarded by category is greater than the total number of patents awarded.

Source: U.S. Patents and Trademark Organization (2024). PatentsView, multiple years.

Figure 30

Climate change technology patents grew by 20 patents (to 96 total) during the most recent 5-year period, 2019-2023. The top South Dakota patent assignees in this category were POET Research and the South Dakota Board of Regents. From 2019 to 2023, there were fewer patent assignees in this category but more patents awarded.

Climate Change Technology: Total Patents Granted to South Dakota Patent Assignees, 2014-2018 and 2019-2023

Organization (n = 18)	2014-2018
POET Research, INC.	34
South Dakota Board of Regents	12
Eagle International, LLC	2
Aquatech Bioenergy LLC	2
JR Koop, Inc.	2
Novita Nutrition, LLC	1
Unlimited Water Solutions LLC	1
Phase Technologies, LLC	1
Renew Energy Maintenance, LLC	1
Information Data Technologies, LLC	1
IntegroEnergy Group Inc.	2
Strategic Rail Systems Company	2
Rush Company, Inc.	1
Heat Mining Company LLC	1
Prairie Aquatech LLC	1
Dakota Fisheries, Inc.	1
Westrom Engineering, LLC	1
Alumend, LLC	1
Total	**67**

Organization (n = 16)	2019-2023
POET Research, Inc.	44
South Dakota Board of Regents	18
Aerostar International, LLC	8
POET Grain (OCTANE), LLC	5
Anderson Industrial Corp.	4
Novita Nutrition, LLC	3
Unlimited Water Solutions LLC	3
Phase Technologies, LLC	2
Renew Energy Maintenance, LLC	2
Information Data Technologies, LLC	1
IntegroEnergy Group Inc.	1
Kolberg-Pioneer, Inc.	1
Individual Inventors	1
Northern Plains Power Technologies	1
Prairie Aquatech LLC	1
Waviot Integrated Systems LLC	1
Total	**96**

Notes: One patent can be included in more than one CPC code. Consequently, the sum of patents awarded by category is greater than the total number of patents awarded.

Source: U.S. Patents and Trademark Organization (2024). PatentsView, multiple years.

Figure 31

Medical and veterinary patents grew by one patent (to 94 total) during the most recent 5-year period, 2019-2023. The number of assignees increased from 18 to 26. The top seven assignees—led by Sanford Health, the South Dakota Board of Regents, and Asfora IP—stayed the same between the two 5-year periods.

Medical or Veterinary Science: Total Patents Granted to South Dakota Patent Assignees, 2014-2018 and 2019-2023

Organization (n=18)	2014-2018
Sanford Health	23
South Dakota Board of Regents	9
Asfora IP, LLC	18
Alumend, LLC	9
Individual Inventors	12
Immutrix Therapeutics, Inc.	3
CEGA Innovations, Inc.	4
AgSense, LLC	2
Dakota Sciences, Inc.	2
Scott Orthotics, LLC	2
FM-Nanocoat, LLC	1
A & R Possibilities, LLP	1
Ad Lunam Labs, Inc.	1
Foxhammer Inc.	1
RYLO, INC.	1
Simplified Dosing Incorporated	1
Ventis Pharma	1
Sanford Health & SD Board of Regents	2
Total	**93**

Organization (n=26)	2019-2023
Sanford Health	29
South Dakota Board of Regents	10
Asfora IP, LLC	9
Alumend, LLC	7
Individual Inventors	6
Immutrix Therapeutics, Inc.	5
CEGA Innovations, Inc.	4
Braasch Biotech LLC	2
Sicage LLC	2
Dark Canyon Laboratories, LLC	2
Equinox Ophthalmic, Inc.	2
Pivotal Health Solutions, Inc.	2
A to Z Technologies, LLC	1
Glycoscience Research, Inc.	1
Thubrikar Aortic Valve Inc	1
Volz Surgical Consulting Inc.	1
KB Balance Products, Inc.	1
Group Holdings, LLC	1
Starlight Investments, LLC	1
SAB, LLC	1
Ventis Pharma	1
Anderson Industrial Corp.	1
VST LLC	1
Professional Server Certification Corp.	1
Proprietary Technology Assets, LLC	1
Sanford Health & SD Board of Regents	1
Total	**94**

Notes: One patent can be included in more than one CPC code. Consequently, the sum of patents awarded by category is greater than the total number of patents awarded.

Source: U.S. Patents and Trademark Organization (2024). PatentsView, multiple years.

Figure 32

Biochemistry patents grew by 14 patents (to 58 total) during the most recent 5-year period, 2019-2023. POET continued to lead patenting activity in biochemistry, followed by the South Dakota Board of Regents and Braasch Biotech.

Biochemistry: Total Patents Granted to South Dakota Patent Assignees, 2014-2018 and 2019-2023

Organization (n = 7)	2014-2018
POET Research, Inc.	30
Aquatech Bioenergy, LLC	2
South Dakota Board of Regents	5
Raven Industries, Inc.	1
Sanford Health	2
Unlimited Water Solutions, LLC	1
SAB, LLC	3
Total	**44**

Organization (n = 9)	2019-2023
POET Research, Inc.	42
POET Grain (Octane), LLC	5
South Dakota Board of Regents	4
Braasch Biotech LLC	2
Sanford Health	1
Unlimited Water Solutions, LLC	1
SAB, LLC	1
Raison, LLC	1
VST LLC	1
Total	**58**

Notes: One patent can be included in more than one CPC code. Consequently, the sum of patents awarded by category is greater than the total number of patents awarded.

Source: U.S. Patents and Trademark Organization, PatentsView.

Figure 33

Agriculture patents decreased by 12 patents (to 55 total) during the most recent 5-year period, 2019-2023. The number of assignees fell from 18 to 14. Raven Industries continued to be the lead assignee and increased its patents between the two 5-year periods.

Agriculture: Total Patents Granted to South Dakota Patent Assignees, 2014-2018 and 2019-2023

Organization (n = 18)	2014-2018
Raven Industries, Inc.	23
Individual Inventors	8
Totally Tubular Mfg., Inc.	5
Sioux Steel Company	8
AgSense, LLC	3
SAB, LLC	3
POET Research, Inc.	3
Dakota Fisheries, Inc.	2
Lankota Group, Inc.	2
Aquatech Bioenergy, LLC	2
SD Board of Regents	1
Hunt605 & Chapsbuck Outdoors, LLC	1
Rush Company, Inc.	1
S7 IP Holdings, LLC	1
Pro Mags LLC	1
GoFish Tackle, LLC	1
C-Lock Inc.	1
Odin Hunting Products, Inc.	1
Total	**67**

Organization (n = 14)	2019-2023
Raven Industries, Inc.	30
Diamond Mowers, LLC	4
Jung Enterprise, Inc.	3
Sioux Steel Company	3
Hemp Processing Solutions, LLC	3
Copperhead Planter Products LLC	3
Totally Tubular Mfg., Inc.	2
Soles Enterprises, Inc	1
Pearson Incorporated	1
Raison, LLC	1
Starlight Investments, LLC	1
Glycoscience Research, Inc.	1
Rush Company, Inc.	1
Pro Mags, LLC	1
Total	**55**

Notes: One patent can be included in more than one CPC code. Consequently, the sum of patents awarded by category is greater than the total number of patents awarded.

Source: U.S. Patents and Trademark Organization (2024). PatentsView, multiple years.

Figure 34

Computing patents increased by seven patents (to 41 total) during the most recent 5-year period, 2019-2023. The top three patent assignees remained the same between the two 5-year periods: Raven Industries, Citicorp, and the South Dakota Board of Regents.

Computing: Total Patents Granted to South Dakota Patent Assignees, 2014-2018 and 2019-2023

Organization (n = 9)	2014-2018
Raven Industries, Inc.	7
Citicorp Credit Services, Inc.	8
South Dakota Board of Regents	1
Daktronics, Inc.	1
METABANK	13
SONIFI SOLUTIONS, INC.	1
C-LOCK INC.	1
Wolf Pack Products, LLC	1
Megathread, Ltd.	1
Total	**34**

Organization (n = 10)	2019-2023
Raven Industries, Inc.	11
Citicorp Credit Services, Inc.	7
South Dakota Board of Regents	6
Daktronics, Inc.	5
METABANK	4
Coin Lion, LLC	3
Baypoint Technology, LLC	2
Wolf Pack Products, LLC	1
Advanced Remote Sensing Inc.	1
Phasica, LLC	1
Total	**41**

Notes: One patent can be included in more than one CPC code. Consequently, the sum of patents awarded by category is greater than the total number of patents awarded.

Source: U.S. Patents and Trademark Organization, PatentsView.

Figure 35

South Dakota Small Business Innovation Research and Small Business Technology Transfer (SBIR/STTR) awards decreased from $7.4 million in 2019 to $2.1 million in 2023. The average size of Phase 2 awards was $1.1 million, while Phase 1 awards average was $155,000.

South Dakota SBIR/STTR Total Award Value by Phase, 2014-2023

Source: U.S. SBIR/STTR Award Database.

Figure 36

Award counts and values have decreased post-COVID, based on 3-year averages. From 2019 to 2021, the average number of awards was 12, with a total value of $4.9 million. After this period, the number of awards decreased by half, averaging six awards valued at $2.9 million in total.

South Dakota SBIR/STTR Total Award Count by Phase, 2014–2023 and 3-Year Averages

Phase	Year										3-Year Averages		
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2017-2019	2019-2021	2021-2023
Phase 1	5	6	2	8	4	12	9	4	5	4	8	8	4
Phase 2	2	2	2	1	5	4	5	2	3	1	3	4	2
Total	**7**	**8**	**4**	**9**	**9**	**16**	**14**	**6**	**8**	**5**	**11**	**12**	**6**

South Dakota SBIR/STTR Total Award Value by Phase, 2014–2023 and 3-Year Averages

Phase	Year										3-Year Averages		
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2017-2019	2019-2021	2021-2023
Phase 1	$0.8	$0.7	$0.4	$1.4	$0.6	$1.7	$1.1	$0.7	$0.9	$0.8	$1.2	$1.2	$0.8
Phase 2	$1.2	$1.7	$2.9	$2.2	$5.7	$5.7	$3.4	$2.2	$2.9	$1.2	$4.5	$3.8	$2.1
Total	**$2.0**	**$2.5**	**$3.3**	**$3.6**	**$6.3**	**$7.4**	**$4.5**	**$2.9**	**$3.9**	**$2.1**	**$5.8**	**$4.9**	**$2.9**

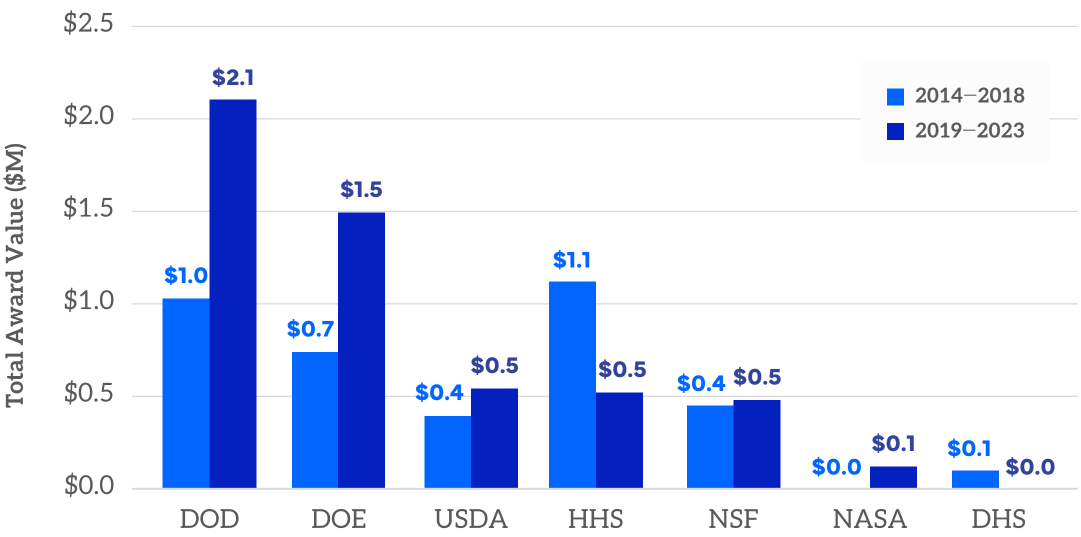
Note: The 2019–2021 Phase 2 award annual average was brought down by a handful awards that were lower than the average $1 million per year. For example, there were two DOD STTR Phase 2 awards that were only $250,000 each.

Source: U.S. SBIR/STTR Award Database.

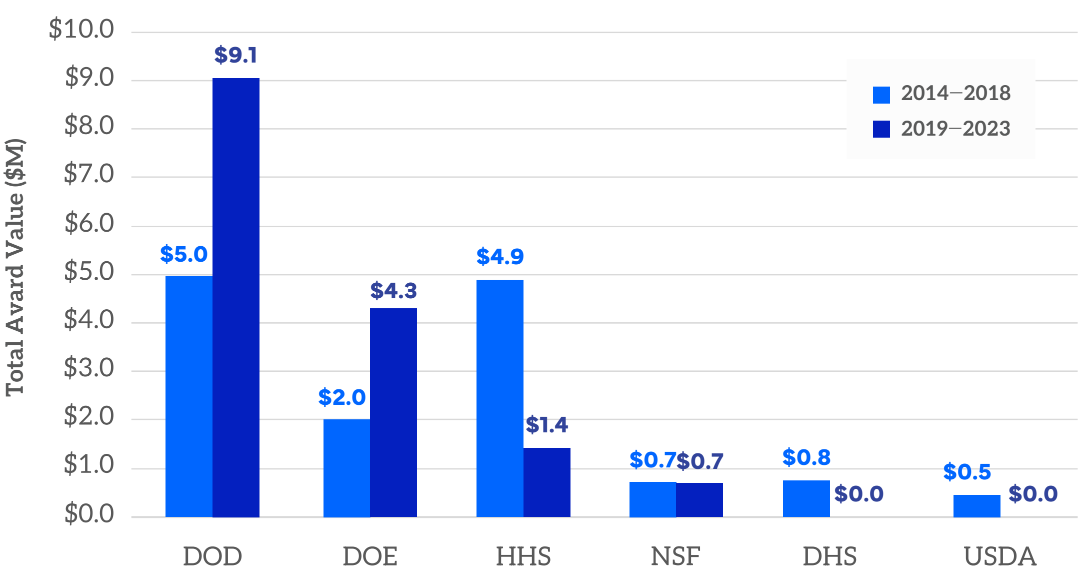
Figure 37

DOD and DOE were the largest funders of both South Dakota Phase 1 and 2 SBIR/STTR awards in the most recent 5-year period, 2019–2023. Both increased significantly between the two 5-year periods. USDA and HHS (which includes NIH) were tied for third largest funder of Phase 1 awards, and HHS was third for Phase 2 awards. South Dakota SBIR/STTR activity funded by HHS decreased substantially for both Phase 1 and 2 awards.

South Dakota SBIR/ STTR Phase 1 Award Value ($M) by Federal Agency, 2014–2018 and 2019–2023



South Dakota SBIR/STTR Phase 2 Award Value ($M) by Federal Agency, 2014–2018 and 2019–2023

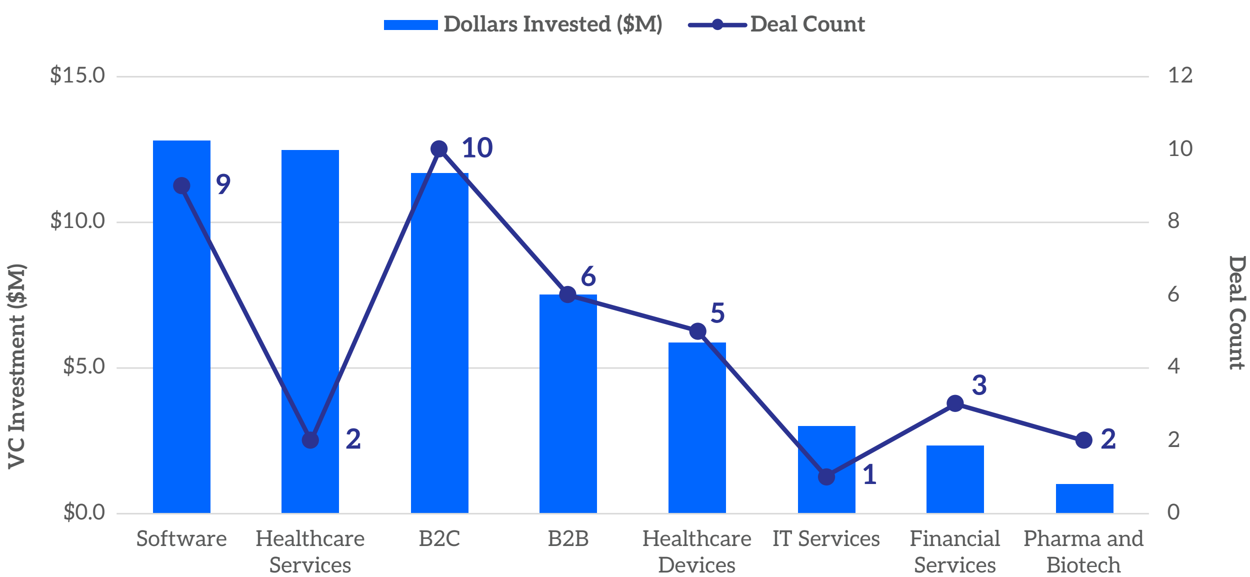


Source: U.S. SBIR/STTR Award Database.

Figure 38

Over the past 5 years, the leading sectors for venture capital (VC) investment in South Dakota have been software, healthcare services, and business-to-consumer (B2C) services. Since 2019, South Dakota companies closed 38 deals, totaling $56.6 million. Although the B2C sector accounted for the most deals (10 deals), the software industry attracted the most investment, $12.8 million.

Count of Deals and Total VC Investment ($M) in South Dakota Companies by Primary Industry Group, 2019–2023



Primary Industry	Deal Count	Investment ($M)	Average ($M)	Minimum ($M)	Maximum ($M)
Software	9	$12.8	$2.1	$0.02	$8.9
Healthcare services	2	$12.5	$6.2	$4.8	$7.7
B2C	10	$11.7	$1.2	$0.01	$3.4
B2B	6	$7.5	$1.3	$0.8	$4.8
Healthcare devices	5	$5.9	$1.2	$0.4	$2.4
IT services	1	$3.0	$3.0	$3.0	$3.0
Financial services	3	$2.3	$0.8	$1.1	$1.1
Pharma and biotechnology	2	$1.0	$1.0	$1.0	$1.0
Total	**38**	**$56.6**	**$1.8**	**$0.01**	**$8.9**

Source: PitchBook Venture Capital and Private Equity Database.

Figure 39

Over the past 10 years, South Dakota had seven successful exits of formerly VC-backed companies. These companies spanned B2B, B2C, IT services, pharma and biotech, energy, and financial services.

Successful Exits of South Dakota's Formerly VC-Backed Companies, 2014–2023

Exit Year	Exit Type	Company	Industry	Acquiring Company
2014	M&A	Capella Inc.	B2B	Retirement LLC
2017	M&A	Earthbend	IT services	High Point Networks
2018	M&A	Montessorium	B2C	Higher Ground Education
2019	M&A	One American Mortgage	Financial services	One American Bank
2020	M&A	Hydrogreen	B2B	CubicFarm Systems
2020	M&A	Nanopareil	Pharma and biotech	Astrea Bioseparations
2022	IPO	Ring-Neck Energy and Feed	Energy	N/A

Notes: M&A = Mergers and acquisitions; IPO = Initial public offering. Types of exits of VC-backed companies, defined as those that return earlier investment to investors, include M&A and IPO.

Source: PitchBook Venture Capital and Private Equity Database.