TAB	DESCRIPTION	ACTION
1	BOARD POLICY III.N. STATEWIDE GENERAL EDUCATION – SECOND READING	Action Item
2	BOARD POLICY III.W. HIGHER EDUCATION RESEARCH – SECOND READING	Action Item
3	BOARD POLICY III.Z. PLANNING AND DELIVERY OF POSTSECONDARY PROGRAMS AND COURSES – SECOND READING	Action Item
4	MILITARY GENERAL EDUCATION CROSSWALK UPDATE	Information Item
5	ANNUAL REMEDIATION REPORT	Information Item
6	ENGINEERING & COMPUTER SCIENCE NEEDS ASSESSMENT & GAP ANALYSIS	Information Item
7	ESTABLISHED PROGRAM TO STIMULATE COMPETITIVE RESEARCH (EPSCor) ANNUAL REPORT	Information Item

SUBJECT

Board Policy III.N., Statewide General Education – Second Reading

REFERENCE

October 2020	The Board approved the first reading of proposed amendments to Board Policy III.N. designating the Executive Director or designee as chair of the GEM Committee.
December 2020	The Board approved the second reading of proposed amendments to Board Policy III.N.
August 2021	The Board approved the first reading of proposed amendments to Board Policy III.N. expanding membership of the GEM Committee to representatives from digital learning, dual credit, and open education. This included amendments to GEM competency areas.
October 2021	The Board approved the second reading of proposed amendments to Board Policy III.N.
December 2022	The Board approved the first reading of proposed amendments to Board Policy III.N that changed the GEM Oral Communication requirement from a minimum of 2 to a minimum of 3 credits and the institutionally-designated credits from a minimum of 6 to a minimum of 5.
February 2023	The Board approved the second reading of proposed amendments to Board Policy III.N
August 2023	The Board approved the first reading of proposed amendments to Board Policy III.N. to allow institutions to propose specialized baccalaureate degree programs that require fewer than 36 general education credits in rare instances.

APPLICABLE STATUTE, RULE OR POLICY

Idaho State Board of Education Governing Policies & Procedures, Section III.N. and III.V.
Idaho Code § 33-3729

BACKGROUND/DISCUSSION

Board Policy III.N., General Education, outlines the statewide General Education Framework, which provides guidance to Idaho's public institutions in identifying courses that meet the General Education Matriculation (GEM) competencies for the facilitation of seamless credit transfer for students. The Framework establishes 36 credits of general education for Associate of Arts, Associate of Science, and baccalaureate degrees. The proposed amendment to this policy creates space for carefully-designed, transfer-specific associate degrees that include fewer general education courses at the associate degree level.

Associate degree general education requirements are established to improve transferability for community college students because it ensures that they are ready to move into their majors after transferring to a four-year institution. However, in some limited cases, a student enrolled at a four-year institution has more flexibility to spread some of their general education over their degree experience while also beginning their major requirements earlier, while a community college student in the same degree track might not. For example, students who are completing an associate degree at a two-year institution with the intent to transfer into an engineering program at a four-year institution cannot get started as quickly on their math and science courses because they must complete all general education requirements. If the same student were to begin at a four-year institution on an engineering degree, they would take some general education and some major-specific courses from their first semester in college. This results in a community college student spending an additional semester or two in college after they have transferred, and it also makes their last two years of college even more challenging than it is for the traditional four-year students (because they have to exclusively complete major courses). This policy will create more parity between four-year and two-year students within specialized degree programs with careful articulation agreements (often called 2+2 agreements).

IMPACT

Approval of the proposed amendments will create a transfer-friendly experience for community college students who intend to matriculate into specialized degrees at four-year institutions.

ATTACHMENTS

Attachment 1 - Board Policy III.N., Statewide General Education – Second Reading

BOARD STAFF COMMENTS AND RECOMMENDATIONS

There were no edits to proposed changes between first and second readings. Staff recommends approval.

BOARD ACTION

I move to approve the second reading of proposed amendments to Board Policy III.N., Statewide General Education, as submitted in Attachment 1.

Moved by __________ Seconded by __________ Carried Yes _____ No _____

ATTACHMENT 1

Idaho State Board of Education
GOVERNING POLICIES AND PROCEDURES
SECTION: III. POSTSECONDARY AFFAIRS
SUBSECTION: N. Statewide General Education ~~February~~October 2023

In our rapidly-changing world, students need to understand how knowledge is generated and created. They need to adapt to new opportunities as they arise as well as effectively communicate and collaborate with increasingly diverse communities and ways of knowing. In combination with major coursework, general education curriculum prepares students to use multiple strategies in an integrative manner to explore, critically analyze, and creatively address real-world issues and challenges. General education coursework provides students with an understanding of self, the physical world, and human society—its cultural and artistic endeavors as well as an understanding of the methodologies, value systems, and thought processes employed in human inquiries. General education helps instill students with the personal and civic responsibilities of good citizenship, and prepares them to be adaptive, life-long learners.

This policy shall apply to the University of Idaho, Boise State University, Idaho State University, Lewis-Clark State College, College of Eastern Idaho, College of Southern Idaho, College of Western Idaho, and North Idaho College (hereinafter "institutions").

1. The state of Idaho's general education framework for Associate of Arts, Associate of Science, and Baccalaureate degrees, outlined below in Figure 1, shall be:

    a. Thirty-one (31) credits or more of the general education curricula must fit within the general education Matriculation (GEM) competency areas defined in subsection 4 of this policy, and
    b. Five (5) or more credits of the general education curricula, which are reserved for institutions to address the specific mission and goals of the institution. For this purpose, institutions may create new competency areas or they may choose to count additional credits from GEM competencies. Regardless, these institutionally designated credits must have learning outcomes linked to Association of American Colleges and Universities (AAC&U) Essential Learning Outcomes.

2. The intent of the general education framework is to:

    a. Establish statewide competencies that guide institutions' determination of courses that will be designated as GEM courses
    b. Establish shared rubrics that guide course/general education program assessment; and
    c. Create a transparent and seamless transfer experience for undergraduate students.

3. There are six (6) GEM competency areas. The first two (2) emphasize integrative skills intended to inform the learning process throughout general education and

major. The final four (4) represent ways of knowing and are intended to expose students to ideas and engage them in a broad range of active learning experiences.

The GEM competency areas are as listed:

a. Written Communication
b. Oral Communication
c. Mathematical Ways of Knowing
d. Scientific Ways of Knowing
e. Humanistic and Artistic Ways of Knowing
f. Social and Behavioral Ways of Knowing

4. GEM courses in each area shall include the following competencies:

   a. Written Communication
   Upon completion of a course in this category, students are able to demonstrate the following competencies:

      i. Use flexible writing process strategies to generate, develop, revise, proofread, and edit texts.
      ii. Adopt strategies and genre appropriate to the rhetorical situation.
      iii. Use inquiry-based strategies to conduct research that explores multiple and diverse ideas and perspectives, appropriate to the rhetorical context.
      iv. Use rhetorically appropriate strategies to evaluate, represent, and respond to the ideas and research of others.
      v. Address readers' biases and assumptions with well-developed evidence-based reasoning.
      vi. Use appropriate conventions for integrating, citing, and documenting source material.
      vii. Read, interpret, and communicate key concepts in writing and rhetoric.

   b. Oral Communication
   Upon completion of a course in this category, students are able to demonstrate the following competencies:

      i. Research, discover, and develop information resources and structure spoken messages to increase knowledge and understanding.
      ii. Research, discover, and develop evidence-based reasoning and persuasive appeals for ethically influencing attitudes, values, beliefs, or behaviors.
      iii. Adapt spoken messages to the diverse personal, ideological, and emotional needs of individuals, groups, or contexts.
      iv. Employ effective spoken and nonverbal behaviors that support communication goals and illustrate self-efficacy.
      v. Listen in order to effectively and critically evaluate the reasoning, evidence, and communication strategies of self and others.

ATTACHMENT 1

vi. Demonstrate knowledge of key theories, perspectives, principles, and concepts in the Communication discipline, as applied to oral communication.

c. Mathematical Ways of Knowing
Upon completion of a course in this category, a student is able to demonstrate the following competencies:

i. Interpret mathematical concepts.
ii. Represent information/data.
iii. Use appropriate strategies/procedures when solving mathematical problems.
iv. Draw reasonable conclusions based on quantitative information.

d. Scientific Ways of Knowing
Upon completion of a non-lab course in this category, a student is able to demonstrate competencies i-iv. A student is able to demonstrate all five competencies, i-v, upon completion of a lab course.

i. Apply foundational knowledge and models of a discipline in the physical or natural sciences to analyze and/or predict phenomena.
ii. Apply scientific reasoning to critically evaluate assertions.
iii. Interpret and communicate scientific information via written, spoken and/or visual representations.
iv. Describe the relevance of specific scientific principles to the human experience.
v. Test a hypothesis in the laboratory or field using discipline-specific tools and techniques for observation, data collection and analysis to form a defensible conclusion.

e. Humanistic and Artistic Ways of Knowing
Upon completion of a course in this category, students are able to demonstrate at least five (5) of the following competencies:

i. Recognize and describe humanistic, historical, or artistic works within problems and patterns of the human experience.
ii. Distinguish and apply methodologies, approaches, or traditions specific to the discipline.
iii. Differentiate formal, conceptual, and technical elements specific to the discipline.
iv. Analyze, evaluate, and interpret texts, objects, events, or ideas in their cultural, intellectual or historical contexts.
v. Interpret artistic or humanistic works through the creation of art, language, or performance.
vi. Develop critical perspectives or arguments about the subject matter, grounded in evidence-based analysis.

vii. Demonstrate self-reflection, widened perspective, and respect for diverse viewpoints.

f. Social and Behavioral Ways of Knowing
Upon completion of a course in this category, students are able to demonstrate all five (5) of the following competencies.

i. Demonstrate knowledge of the theoretical and conceptual frameworks of a particular Social Science discipline.
ii. Describe self and the world by examining the dynamic interaction of individuals, groups, and societies as they shape and are shaped by history, culture, institutions, and ideas.
iii. Utilize Social Science approaches, such as research methods, inquiry, or problem-solving, to examine the variety of perspectives about human experiences.
iv. Evaluate how reasoning, history, or culture informs and guides individual, civic, or global decisions.
v. Identify the impact of the similarities and differences among and between individuals, cultures, or societies across space and time.

5. General Education Requirements

a. This subsection applies to Associate of Arts, Associate of Science, and Baccalaureate degrees. For the purpose of this policy, disciplines are indicated by course prefixes.

General education curricula must reflect the following credit distribution:

Competency Area	**Minimum Credits**
Written Communication	6
Oral Communication	3
Mathematical Ways of Knowing	3
Scientific Ways of Knowing	7 (from two different disciplines with at least one laboratory or field experience)
Humanistic and Artistic Ways of Knowing	6 (from two different disciplines)
Social and Behavioral Ways of Knowing	6 (from two different disciplines)
Institutionally-Designated Credits	5

i. GEM courses are designed to be broadly accessible to students regardless of major, thus college-level and non-GEM pre-requisites to GEM courses should be avoided unless deemed necessary by the institution.

ii. Additional GEM courses, beyond the general education curricula, may be required within the major for degree completion.

b. In rare instances, a specialized associate degree program might better serve students by distributing general education requirements differently than those listed above. Proposals for such programs shall be submitted to the Board office for review and approval on a case-by-case basis. Proposals must describe the demonstrable benefits that the alternative general education distribution will have for transfer students, the institutions' plans for additional advising, and any other information that will demonstrate how students will not be harmed by this alternative structure.

~~b.~~c. This subsection pertains to Associate of Applied Science (AAS) degrees.

The general education curricula for the AAS degree must contain a minimum of fifteen (15) credits, so distributed in the following areas:

Competency Area	Minimum Credits
Written Communication	3
Oral Communication	3
Mathematical Ways of Knowing	3
Social and Behavioral Ways of Knowing	3
Any general education course including institutionally designated courses	3

d. GEM courses and institutionally designated courses shall transfer as meeting an associated general education competency requirement at any institution pursuant to Board policy Section III.V.

6. Governance of the General Education Program and Review of Courses

a. GEM courses are developed by faculty and approved via the curriculum approval process of the institution delivering the courses. Faculty discipline groups representing all institutions shall meet at least annually or as directed by the Board, to ensure consistency and relevance of general education competencies and courses approved for their respective GEM competency areas.

b. Common Course Indexing is developed for courses offered within the GEM framework to provide greater transparency and seamlessness within transfer processes at Idaho's postsecondary institutions. Common-indexed courses are accepted as direct equivalents across institutions for transfer purposes. Common course indexing shall include common course prefix, common course number, common course title, and common GEM discipline area designation. The common course number shall be three digits in sequence, but can be preceded by a single digit if four numbers are utilized by the institution (x###).

The common course list shall be approved by the Board on an annual basis and shall be maintained by the Board office. Changes to the list may be proposed by faculty discipline groups to the General Education Matriculation Committee. Proposed additions or removal of courses on the common course list must be reviewed by the General Education Matriculation Committee prior to Board approval. The request to remove a common-indexed course from an institution's academic catalog must be approved by the Board. The request to discontinue a course must be submitted in writing by the institution to the Board office. The request shall be submitted no less than a year in advance and provide rationale for the inability to offer the course.

c. The General Education Matriculation (GEM) Committee shall consist of a Board-appointed representative from each of the institutions, from the Division of Career Technical Education, from the Idaho Registrars Council, from the digital learning community, from the dual credit community, from the open education community; and the Executive Director of the Board, or designee, who shall serve as the chair of the committee. To ensure alignment with AAC&U Essential Learning Outcomes and subsection 1, the Committee shall meet at least annually to review the competencies and rubrics of the general education framework. The Committee shall make recommendations to the Board regarding the general education framework and the common course list. The Committee shall review and make recommendations on the general education competencies as necessary. GEM Committee duties are prescribed by the Board, including those that may involve addressing issues related to competency areas and course offerings. The GEM Committee reports to the Council on Academic Affairs and Programs.

d. The institutions shall identify all general education courses in their curricula and identify them in a manner that is easily accessible by the public via their respective websites, as well as relevant web resources maintained by the Board office.

SUBJECT

Board Policy III.W. Higher Education Research – Second Reading

REFERENCE

June 17, 2010	Board approved a second reading to Board Policy III.W. Higher Education Research
August 11, 2011	Board approved first reading to Board Policy III.W. Higher Education Research
October 20, 2011	Board approved a second reading to Board Policy III.W. Higher Education Research
March 23, 2012	Board approved Higher Education Research Council IGEM Program Guidelines
October 10, 2014	Board approved an amendment to the Center for Advanced Energy Studies (CAES) Tenant Use Agreement and Consortium Agreement, adding the University of Wyoming and directed BSU, ISU, and UI to report annual to Board on institution related CAES activities through the Higher Education Research Council.
December 15, 2016	Board approved first reading of Board Policy III.W., adding the IGEM Funding requirements, amending the post award accountability requirements for all funded programs, and adding the CAES reporting requirements.
February 16, 2017	Board approved a second reading of Board Policy III.W.
June 15, 2022	Board approved the Higher Education Research Strategic Plan for 2023-2027
August 8, 2023	Board approved the first reading of Board Policy III.W. establishing clearer alignment with the vision, mission, and structure of the Higher Education Research Council.

APPLICABLE STATUTE, RULE, OR POLICY

Idaho State Board of Education Governing Policies and Procedures, Section III.W., Higher Education Research Council Policy

BACKGROUND/DISCUSSION

The Higher Education Research Council (HERC) has worked to align its vision, mission, and structure more closely with the newly adopted 2023-2027 Higher Education Research Strategic Plan. The amendments include an update to the purpose and coverage of the policy, removal of the research philosophy section (which will be moved to HERC's bylaws), clarification about which funding programs are required versus optional, inclusion of undergraduate research as a required funding program, removal of specific reporting criteria/procedures with direction for HERC to establish as needed, and updates to the organizational structure of the Council. The amendments also remove the University of Wyoming as one of the partners of the Center for Advanced Energy Studies (CAES), as this institution withdrew from the collaboration in 2022. The Memorandum of Understanding establishing CAES in collaboration with the Idaho National Laboratory (INL) was last amended by the Board at a special meeting in October 2014. With Wyoming's withdrawal from CAES, the memorandum will need to be updated.

IMPACT

Approval of the amendments to Board Policy III.W. will establish clearer alignment between the vision, mission, and structure of HERC with the newly adopted 2023-2027 Higher Education Research Strategic Plan. The amendments also provide more flexibility to the Council in administering state research funds to achieve the goals of the Strategic Plan.

ATTACHMENTS

Attachment 1 – Board Policy III.W., Higher Education Research – Second Reading

STAFF COMMENTS AND RECOMMENDATIONS

No changes were made between first and second readings. Staff recommends approval.

BOARD ACTION

I move to approve the second reading of Board Policy III.W., Higher Education Research as submitted in Attachment 1, and to direct staff to work with INL to develop any necessary updates to the CAES MOU and bring proposed updates to the Board for its consideration.

Moved by____________ Seconded by___________ Carried Yes_____ No_____

Idaho State Board of Education
GOVERNING POLICIES AND PROCEDURES
SECTION: III. POSTSECONDARY AFFAIRS
SUBSECTION: W. Higher Education Research February 2017October 2023

1. Higher Education Research Council

a. Purpose and Coverage
b.a.

Idaho's universities seek to be a driving force in innovation, economic development and enhanced quality of life in the State of Idaho through nationally and internationally lauded research programs in strategic areas. By developing and leveraging the State's unique research expertise and strengths, Idaho's universities will serve as catalyst and engine to spur the creation of new knowledge, technologies, products and industries. This in turn will lead to new advances and opportunities for economic growth and enhance the State's reputation as a national and international leader in excellence and innovation.

The Higher Education Research Council of the Idaho State Board of Education (HERC) provides guidance – to Boise State University, Idaho State University, Lewis-Clark State College and the University of Idahothe Idaho State Board of Education- in establishing and maintaining for a statewide collaborative effort to drive innovation and economic development in Idaho through research and creative activity and to help Idaho become a research destination. accomplish these goals and objectives. In addition, HERC provides direction for and oversees themanages the use of financialthe limited resources of the State of Idaho provided to the Board by the Legislature for research bythe purpose of promoting research activities that will have the greatest beneficial effect on the quality of education and the economy of the State. HERC also oversees Tthe implementation of the higher education research this policypolicy, and of the Board will be the duty and responsibility of HERC. HERC shall reports annually to the Board on a schedule and in a format established by the Executive Director or designee.

c. The Role of Research in Higher Education
Research is the creative search for and application of new knowledge.

i. Philosophical Statements and Guiding Principles

The significant role science, technology and other research play in statewide economic development is also accompanied by a demand for the scrutiny of publicly funded research, accountability, and attention to the management of ethical, legal, and safety issues associated with academic research. To fulfill this role, HERC will direct and oversee the development, implementation, and

~~monitoring of a statewide strategic plan for research. The development of a statewide strategic plan for research will assist in the identification of general research areas that will enhance the economy of Idaho via partnering between academia, industry, and/or government. HERC will facilitate this partnering and interaction among business, industry and the public sector with science, engineering and other research faculty.~~

~~This Policy is designed to assist the public baccalaureate and post-baccalaureate institutions in addressing these areas via appropriate research activities through:~~
~~1) individual and multi-disciplinary research projects;~~
~~2) extensive and rapid dissemination of the new knowledge and establishment of knowledge networks which would facilitate public, private, and academic institution interaction; and~~
~~3) collaborative relationships between academia and varied shareholders outside the academy.~~

~~The guiding principles are:~~

~~1) to maximize impact on the quality of education and economic development as a consequence of Idaho's investment in quality science, engineering, and other research.~~
~~2) to ensure accountability for the state's investment via demonstrable results.~~

~~ii. Support of research activities with public funds is important because:~~

~~1) Research is important in the education of students at all levels.~~
~~2) Research plays an important role in maintaining and enhancing faculty quality.~~
~~3) Academic research contributes to economic development.~~

~~iii. The Board desires to increase the quality and quantity of research and to encourage continued public and private support of research in Idaho through application of the following principles:~~

~~The quality and quantity of academic research produced is extremely dependent upon the research infrastructure.~~
~~Faculty at Idaho's baccalaureate and post-baccalaureate institutions will be eligible to compete for research funds.~~

~~iv. The development and implementation of a statewide strategic plan for research is a vehicle for identification of research objectives and areas.~~

~~d.~~b. S~~S~~pecific Funding Programs to Strengthen Research in Idaho

The Board recognizes that talent exists on all of the campuses and the importance of permitting competition for research support and initiation of funds at all institutionsthe postsecondary institutions under the Board's governance. Therefore, the BoardHERC shall will use the following criteria support the following required in allocating funds for research activities and may choose to support the following optional research activities through allocation of state funds:- under this policy at the various institutions.

Additionally, any condition set forth in the legislative appropriation for these research programs must be demonstrably met by the programs and/or projects that are to receive the appropriation.

i. Infrastructure Funding (Required)

A portion of the competitive research funding should shall be distributed to the state's baccalaureate and post-baccalaureatefour-year institutions to support their science, engineering, and other research infrastructure. Distribution of these funds shallwill be made according to guidelines approved by HERC. These funds should shall be reserved for library support essential to research, graduate research assistantships, post doctoralpost-doctoral fellows, technician support, maintenance contracts, research equipment, competitively awarded summer research support, startup funds for new hires, and incentives to reward faculty for their research achievements.

ii. Targeted Research Funding (Optional)

Faculty members at the state's baccalaureate and post-baccalaureate institutions shallwill have an opportunity to submit research project proposals for review under this programa competitive grant program.

1) All projects selected for funding under this program will demonstrate the potential for economic benefit or cost savings for the State.
2) A major focus under this program should be start-up and seed funds that will assist a principal investigator in promoting basic or applied research; competing for external funding; and enhancing technology transfer or commercialization.
3) Collaborative research projects are encouraged.

Guidelines for this program shallwill be established and maintained by HERC, will may incorporate an independent peer review, and shallwill include an evaluation component for commercial applicability for the benefit of the State.

iii. Research Centers Funding (Optional)

Many important research advances are made through focused research centers. These centers should involve several faculty members from multiple institutions in conjunction with the necessary research equipment and support personnel. The funds needed to establish centers of this type should be adequate to create a critical research mass for multiple years leading to research center sustainability. State funding should be supplemented by non-state matching funds.

iv. State Matching Awards (Required)

~~Under this program~~ State funds ~~would~~ shall be available to match those awarded by non-state sources by using an external peer review process. Examples of matching entities for the state matching funds ~~would be~~include:

1) Federal Agencies
2) EPSCoR projects e.g., National Science Foundation, National Institute of Health, Department of Energy, Department of Defense, National Aeronautics and Space Administration, etc.
3) Foundations
4) Business and Industry
5) Other, as determined by the Board on recommendation from HERC

v. Idaho Global Entrepreneurial Mission Funding (Required)

Funding under this program ~~will~~shall be awarded for competitive state university research in support of the goals of the Idaho Global Entrepreneurial Mission (IGEM) initiative (pursuant to H659, Section 5 (2012)). These funds are to be used as seed funding for strengthening Idaho's future by strategically investing in the development of expertise, products, and services which result in state economic growth.

Selected project proposals will be in alignment with the statewide higher education research strategic plan and will leverage the talents and expertise of Idaho's higher education research activities and the private sector to further the economic vitality of the state; create a platform to facilitate and accelerate the transfer of technology out of Idaho's public ~~state~~ research facilities and into the private sector; and create new ideas, products and companies that will lead to higher-paying jobs and a strong economic foundation for Idaho.

Priority shall~~will~~ be granted to those proposals that can show a strong collaborative effort between institutions as well as the private sector or exhibit high potential for near term technology transfer to the private sector.

Further guidelines for this program shall~~will~~ be established by HERC~~, and~~ may~~will~~ incorporate an independent peer review of proposals, and shall include an evaluation component for identifying the project success and economic benefit to the State. Performance measures established for project post-award accountability will be specific, objective, measurable and realistic. Awards may span multiple years, but shallwill be evaluated for effectiveness annually.

vi. Undergraduate Research Funding (Required)

A portion of the competitive research funding shall be distributed to the institutions to support undergraduate research activity and the Idaho Conference on Undergraduate Research. Undergraduate research funds may be distributed to the community colleges. Distribution of these funds shall be made according to guidelines approvedestablished by HERC.

e.c. Post-Award Accountability

Any project receiving funding through any of the previously described Board sponsored programs will be required to report annually on the quality, relevance, and impact of the project. Reporting measures may include such items as:

Quality
Presentations at professional meetings and conferences;
Patents awarded or pending;

Relevance
Importance of project to Idaho industries;
External funding earned as a result;
Citations;
Programmatic impacts;

Impact
Number of undergraduate and graduate students involved;
Number of faculty involved;
Collaborations between universities and industries of Idaho;
Problem resolution;
Economic benefits.

Additionally, any condition set forth in the legislative appropriation for these research programs must be demonstrably met by the programs and/or projects that are to receive the appropriation.

Specific criteria and Rreporting procedures shallwill be established and administered through HERC.

f.d. Responsibilities and Membership of the Higher Education Research Council

In order to advise the Idaho State Board of Education on the implementation of the above ~~strategies~~activities, HERC will report to the Board through the Instruction, Research and Student Affairs Committee. ~~The assigned responsibilities of HERC will include the following~~HERC shall be assigned the following specific responsibilities:

i. Direct and oversee the development of a 5-year higher education statewide strategic plan for research;
ii. Direct and oversee the use of ~~lLegislatively~~funds appropriated ~~funds~~ to the Board for higher education research;
iii. Determine and distribute to all interested parties the guidelines for submission of proposals under the competitive programs;
iv. Organize the review procedures for proposals submitted under the guidelines mandated;
~~v.~~ Monitor the ~~productivity~~ quality, relevance, and impact of each funded project to warrant continued funding and to provide accountability.

The membership of HERC shall consist of:

i. the ~~V~~vice ~~P~~presidents of ~~R~~research from Boise State University, Idaho State University, and the University of Idaho and a representative ~~of~~ from Lewis-Clark State College;
ii. a representative ~~of~~ from ~~the~~ Idaho National Laboratory (INL); and
iii. three non-institutional representatives, with consideration of geographic, private industry involvement and other representation characteristics.

The Board shall appoint the three non-institutional representatives and the representative from INL. The three non-institutional representatives shall be appointed for no more than two (2) three-year terms that are initially staggered to provide a rolling renewal of appointments. ~~Thereafter, appointments shall be for three years~~. ~~The appointments of the representative of INL shall be subject to approval of the Board.~~ All members of HERC shall have equal voting privileges.

~~One (1) of the Vice Presidents of Research shall serve as chair of the Council, with a new chair selected each academic year such that the chair shall rotate among the Vice Presidents of Research. No Vice President of Research shall serve as chair of the Council for more than three (3) consecutive terms.~~

~~Executive Committee:~~
The Council shall have an ~~The~~ Executive Committee that ~~shall~~ includes a chair, a chair-elect, and a non-institutional representative who is a member of the Council. The chair and chair-elect shall rotate annually among the ~~V~~vice ~~P~~presidents of ~~R~~research at the universities and the representative from Lewis-Clark State College. No chair shall serve for more than three (3) consecutive

terms. The non-institutional representative shall be nominated by another non-institutional representative of the Council and shall serve no more than (1) consecutive term on the Executive Committee. Terms of office shall be based on the fiscal year.consist of the three Vice Presidents of Research.

g.e. Nominating Process for Non-Institutional Members

HERC shall nominate non-institutional candidates for membership for Board consideration. The list of candidates, including letters of interest and biographical information, must be forwarded to the Board for consideration not less than 60 days prior to expiration of the term of a committee member, or within 30 days after any vacancy.

i. Incumbent Reappointment of Non-Institutional Members

If the incumbent candidate is interested in reappointment and is eligible to continue serving based on HERC's current membership structure, the incumbent will provide, in writing his, or her interest for reappointment, which will be reviewed by the Executive Committee and, if approved, forwarded to the Board for consideration.

ii. Open Appointment of Non-Institutional Members

1) HERC members shall solicit nominations with consideration given to geographic, private industry involvement, and other representation characteristics.

2) Each nominee must provide a written statement expressing his or her interest in becoming a member of HERC. Each nominee must also provide a description of his or her qualifications, and must identify his or her primary residence.

3) HERC will review all nominations for the vacant position and will forward the qualified candidates with recommendations to the Board for consideration.

The Board may, after a review of nominee's pursuant to the process described herein, consider other candidates for HERC membership identified by the Board or its staff.

The Vvice Ppresidents for Rresearch at the universities are de-factoshall serve as ex-officio members of the Council by virtue of their positions and -do not require nomination or Board approval. The representative from Lewis-Clark State College shall be determined nominated by the Ppresident of the college, and does not require nomination or subject to Board approval. The representative from INL shall be determined by the Laboratory Director and does not require nomination, but does require Board approval.

2. EstablishedExperimental Program to Stimulate Competitive Research (EPSCoR)

   a. Overview

      The EstablishedExperimental Program to Stimulate Competitive Research (EPSCoR) represents a federal-state partnership to enhance the science and engineering research, education, and technology capabilities of states that traditionally have received smaller amounts of federal research and development funds. As a participating state, Idaho EPSCoR shall be subject to federal program requirements and policy established by the Idaho State Board of Education (Board). The purpose of EPSCoR is to build a high-quality, academic research base to advance science, technology, engineering and mathematics (STEM) to stimulate sustainable improvements in research and development capacity and competitiveness.

   b. EPSCoR Mission

      Idaho EPSCoR's mission shall be to stimulate systematic and sustainable improvements in Idaho's academic science, technology, engineering and mathematics (STEM) research capabilities for the purpose of establishing nationally prominent research competitiveness in selected areas eligible for support by the National Science Foundation and other federal and private sponsors. It is expected that EPSCoR investments shall harmonize with the research interests of Idaho's public universities, the State of Idaho, and Idaho's industries. The University of Idaho, Idaho State University and Boise State University are Idaho EPSCoR partner institutions.

   c. Idaho EPSCoR Committee

      Idaho EPSCoR shall be guided by a committee appointed by the Board.

      i. Duties and Responsibilities

         The Idaho EPSCoR Committee shall serve under the direction of the Board and shall oversee the implementation of the Idaho EPSCoR program and office. The Idaho EPSCoR Committee is responsible for the selection and progress of EPSCoR projects funded by various federal agencies, in accordance with agency-specific guidelines. The committee shall establish policies and procedures to ensure that EPSCoR program goals and objectives are met. These policies and procedures shall be brought to the Board for approval. The committee will carry out the following EPSCoR objectives:

1) To catalyze key research themes and related activities within and among EPSCoR jurisdictions that empower knowledge generation, dissemination and application;
2) To activate effective jurisdictional and regional collaborations among academic, government and private sector stakeholders that advance scientific research, promote innovation and provide multiple societal benefits;
3) To broaden participation in science and engineering by institutions, organizations and people within and among EPSCoR jurisdictions; and
4) To use EPSCoR for development, implementation and evaluation of future programmatic experiments that motivates positive change and progression.

ii. Operating Procedures

The committee will meet in person annually, and more often by teleconference to fulfill its duties. Additional meetings may be called by the chair or by request of three (3) or more committee members. The chair will appoint subcommittees as needed. The appointments are subject to review of the entire committee. On a regular basis, the committee shall monitor the activities of the project director and provide direction as necessary.

The project director, under the direction of the chair, prepares the agenda, schedules each meeting of the committee and maintains a written record of the committee's activities.

Membership

Committee membership shall be constituted to provide for geographic, academic, business and state governmental representation. The committee shall consist of sixteen (16) members with voting privileges, composed of the following:

1) The ~~V~~vice ~~P~~president for ~~R~~research or ~~C~~chief ~~R~~research ~~O~~officer at the University of Idaho, Idaho State University, and Boise State University;
2) One member from each chamber of the Idaho state legislature;
3) One representative from Idaho National Laboratory;
4) One representative from the Idaho Department of Commerce – such individual shall be focused on economic development;
5) The remainder shall be representatives of the private sector who have a stake in developing the state's research infrastructure or who have experience in innovation and entrepreneurial activities, applied research and development, management and finance, or community economic development.

In addition, one representative of the Governor's office and one member of the Board shall serve on the committee as ex officio members without voting rights. The member of the Board shall be appointed by the Board President.

iii. Nominating Process

The Idaho EPSCoR Committee will nominate candidates for committee membership for consideration by the Board. The list of candidates must be forwarded to the Board for consideration not less than 60 days prior to expiration of the term of committee member, or within 30 days after any vacancy.

1) Incumbent Reappointment
In the event that the incumbent candidate is interested in reappointment and is eligible to continue serving, the nominating committee shall forward a recommendation to the Board, along with a letter of interest and statement of qualifications for the incumbent. The Board may choose to reappoint the incumbent without soliciting other candidates, thus completing the appointment procedures. If there is no incumbent seeking reappointment, or if the Board chooses not to reappoint an incumbent, the procedures are as outlined in item (2).

2) Open Appointment
a) The EPSCoR committee on behalf of the Board will advertise the vacancy in appropriate state, regional or local publications. Such advertisements will solicit interested persons to apply for the vacant position on the Idaho EPSCoR Committee.
~~a)~~b) Each applicant must provide a written statement expressing his or her interest in becoming a member of the committee. Each applicant must also provide evidence of his or her qualifications, and must identify his or her primary residence.
~~b)~~c) The EPSCoR committee will review all applications for the vacant position and conduct interviews as deemed necessary. The purpose of this review is to identify the most qualified candidates for Board consideration.
~~c)~~d) The EPSCoR committee will forward the qualified candidates, in order of preference, to the Board for consideration. The Board may provide for interviews of the candidates, if needed.

The Board may, after review of the candidates nominated by the committee pursuant to the process described herein, consider other candidates for committee membership identified by the Board or its staff.

iv. Terms of Membership

Committee members shall serve five-year terms with the exception of the Vvice Ppresidents of Rresearch and the non-voting ex-officio members. An incumbent member may be nominated by the committee for re-appointment by the Board, but no member may serve more than three (3) consecutive terms. All terms, regardless of length, shall begin on July 1st and end on June 30th of the year(s) beginning or ending said term. Members who serve by virtue of their position, without terms, are not subject to the term limits and serve at the pleasure of the Board.

Appointments will be staggered to ensure that no more than one-third (1/3) of the appointments will become vacant in any given year. An appointee who has reached the end of his or her term shall remain in service as a committee member until reappointment, or until the appointment of a new member is named and approved by the Board. Officers will be nominated and elected by a vote of the committee.

d. Reporting

The committee shall prepare an annual report to the Board that details all projects by federal agency source, including reports of project progress from associated external Project Advisory Board (PAB).

e. Idaho EPSCoR Office

Within guidelines specified by NSF and this policy, the EPSCoR committee shall determine and select an Idaho EPSCoR partner institution to serve as the lead institution which will house the project director for purposes of administering Idaho EPSCoR and providing support and resources to the Idaho EPSCoR Committee.

f. Idaho EPSCoR Project Leadership

The project director and any associate project directors are selected by and serve under the direction of the Idaho EPSCoR Committee.

The project director shall be a tenured faculty member of an Idaho EPSCoR partner institution whose qualifications must include: a successful research track record (grants and professional publications) in science or engineering, experience in research management and academic administration, and a successful record of dealing with various segments of academic institutions, government, industry, and the public.

3. Center for Advanced Energy Studies

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The Center for Advanced Energy Studies (CAES) is an ongoing research collaboration among Battelle Energy Alliance, LLC (BEA), Boise State University (BSU), Idaho State University (ISU), and the University of Idaho (UI), ~~and the University of Wyoming~~ with its main location at the ISU/CAES building in Idaho Falls. Structure and administration of the collaborative is outlined through a consortium agreement. The agreement adds structure to the CAES collaboration while continuing to recognize each CAES member as a separate governmental entity operating under each member's own legal standing.

BSU, ISU, and UI shall report annually to Board on institution related CAES activities, including the expenditure of CAES appropriated funds through the Higher Education Research Council. The timing and format of such reports shall be established by HERC.

SUBJECT

Board Policy III.Z., Planning and Delivery of Postsecondary Programs and Courses – Second Reading

REFERENCE

October 20, 2016	The Board approved the first reading of the proposed amendments to Board Policy III.Z., updating institutions' statewide program responsibilities.
December 15, 2016	The Board approved the second reading of proposed amendments to Board Policy III.Z.
December 21, 2017	The Board approved the first reading of proposed amendments to Board Policy III.Z., changing the planning timeframe from five years to three years.
February 15, 2018	The Board approved the second reading of proposed amendments to Board Policy III.Z.
June 21, 2018	The Board approved the first reading of proposed amendments to Board Policy III.Z., adding responsibilities for applied baccalaureate degrees to each region.
August 16, 2018	The Board approved the second reading of proposed amendments to Board Policy III.Z.
June 10, 2020	The Board approved the first reading of proposed amendments to Board Policy III.Z., changing the name of a statewide program listed for the University of Idaho.
August 26, 2020	The Board approved the second reading of proposed amendments to Board Policy III.Z.
February 18, 2021	The Board approved the first reading of proposed amendments to Board Policy III.Z that added new definitions for high-demand programs and joint programs.
April 22, 2021	The Board approved the second reading of proposed amendments to Board Policy III.Z.
October, 2022	The Board approved the first reading of proposed amendments to Board Policy III.Z. that described a set of minimum criteria by which the Board will evaluate proposals by the universities to offer new associate degrees and proposals by the community colleges to offer baccalaureate degrees.
December 21, 2022	The Board approved the second reading of Board Policy III.Z.
April 25, 2023	The Board approved the first reading of Board Policy III.Z. related to academic programming in the prison system.
August 8, 2023	The Board approved the first reading of Board Policy III.Z. exempting prison education from the policy.

APPLICABLE STATUTE, RULE, OR POLICY

Idaho State Board of Education Governing Policies and Procedures, Section III.Z. and Section III.G.
Idaho Code §§ 33-113, 33-123, 33-2101

BACKGROUND/DISCUSSION

The purpose of Board Policy III.Z, "is to ensure Idaho's public postsecondary institutions meet the educational and workforce needs of the state through academic planning, alignment of programs and courses, and collaboration and coordination." The purpose is to also meet the statutory requirement to "as far as practicable prevent wasteful duplication of effort" by the institutions.

In 2022, Lewis-Clark State College ("LC State") and University of Idaho ("UI") were selected as two of 73 institutions throughout the nation to participate in the U.S. Department of Education's Second Chance Pell Experiment. This program allows incarcerated individuals to access federal Pell grants to pay for higher education. LC State and UI have worked closely with the Idaho Department of Correction (IDOC) to increase programming for adults within the prison system.

LC State has specifically requested action from the Board to allow it to offer face-to-face academic undergraduate education in prison locations outside its designated Service Regions (Regions I and II). LC State has established a Memorandum of Understanding with IDOC that would allow the College to offer face-to-face undergraduate courses and programs throughout the prison system. LC State has offered face-to-face instruction at the Idaho Correctional Institution – Orofino during the 2022-23 academic year to approximately 58 students in courses leading to associate degrees in liberal arts, business, and welding. However, LC State is currently only designated by Policy III.Z. to offer undergraduate education in Regions I and II using the face-to-face modality. Similarly, UI is only designated to offer face-to-face graduate education in Regions I and II.

Board staff received feedback from the leadership at IDOC, stating that they would prefer the Board exempt face-to-face academic undergraduate education in prison facilities from the restrictions in Board policy. IDOC leadership cited a desire for "maximum flexibility around which institution can provide on-site programming," and that they would also like more direct influence over what programs are offered in the prison system by the institutions.

IMPACT

Board approval of the exemption language would allow LC State to offer face-to-face academic undergraduate education in other Service Regions in the upcoming academic year. It would also allow IDOC to work with other institutions in the future, if desired.

ATTACHMENTS

Attachment 1 – Board Policy III.Z. Planning and Delivery of Postsecondary Programs and Courses – Second Reading

STAFF COMMENTS AND RECOMMENDATIONS

No changes were made between first and second readings. Board staff recommends approval.

BOARD ACTION

I move to approve the second reading of proposed amendments to Board Policy III. Z., Planning and Delivery of Postsecondary Education Programs and Courses as submitted in Attachment 1.

Moved by __________ Seconded by __________ Carried Yes _____ No _____

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Idaho State Board of Education
GOVERNING POLICIES AND PROCEDURES
SECTION: III. POSTSECONDARY AFFAIRS
Subsection: Z. Planning and Delivery of Postsecondary Programs and Courses
~~December 2022~~October 2023

The purpose of this policy is to ensure Idaho's public postsecondary institutions meet the educational and workforce needs of the state through academic planning, alignment of programs and courses (hereinafter referred to collectively as "programs"), and collaboration and coordination. This subsection shall apply to the University of Idaho, Boise State University, Idaho State University, Lewis-Clark State College, College of Eastern Idaho, College of Southern Idaho, College of Western Idaho, and North Idaho College (hereinafter "institutions"). The State Board of Education (the Board) aims to optimize the delivery of academic programs while allowing institutions to grow and develop consistent with their vision and mission with an appropriate alignment of strengths and sharing of resources.

This policy requires the preparation and submission of academic plans to advise and inform the Board in its planning and coordination of educational programs in a manner that enhances access to quality programs, while concurrently increasing efficiency, avoiding unnecessary duplication and maximizing the cost-effective use of educational resources through coordination between institutions. As part of this process, the Board hereby identifies and reinforces the responsibilities of the institutions governed by the Board to deliver Statewide Programs. The provisions set forth herein serve as fundamental principles underlying the planning and delivery of programs pursuant to each institution's assigned Statewide and Service Region Program Responsibilities. These provisions also require collaborative and cooperative agreements, or memorandums of understanding, between and among the institutions.

This policy is applicable to campus-based face-to-face programs, including those that use technology to facilitate and/or supplement a physical classroom experience. It also applies to hybrid and blended programs where a substantial portion of the content is delivered on-line and typically has reduced seat time.

1. Definitions

   a. Designated Institution shall mean an institution whose main campus is located in a service region as identified in subsection 2.b.ii.1) and 2) below; and which possesses the first right to offer programs within its designated service region(s).

      i. With respect to academic programs, Designated Institutions and Partnering Institutions shall have Service Region Program Responsibility for those regions identified in subsection 2.b.ii.1).

      ii. With respect to career technical programs, Designated Institutions and

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Partnering Institutions shall include only the College of Southern Idaho, College of Western Idaho, North Idaho College, College of Eastern Idaho, Lewis-Clark State College, and Idaho State University and shall have Service Region Program Responsibility for those regions identified in subsection 2.b.ii.2).

b. A memorandum of understanding (MOU) is an agreement between two or more institutions offering duplicative programs within the same service region that details how such programs will be delivered in a collaborative manner. An MOU is intended to provide specific, practical details that build upon what has been provided in each Institution's Plan.

c. High-Need Program shall mean a program identified by an institution or the Board as critical to supporting the future growth of a profession.

d. Joint Program shall mean an educational program jointly developed and delivered concurrently by two or more institutions.

e. Partnering Institution shall mean either
   i. an institution whose main campus is located outside of a Designated Institution's identified service region but which, pursuant to a Memorandum of Understanding, offers Regional Programs in the Designated Institution's primary service region, or
   ii. an institution not assigned a Statewide Program Responsibility which, pursuant to a Memorandum of Understanding with the institution assigned the Statewide Program Responsibility, offers and delivers a statewide educational program.

f. Service Region Program shall mean an educational program identified by the Board to be delivered by a Designated Institution within its respective service region that meets regional educational and workforce needs.

g. Service Region Program Responsibility shall mean an institution's responsibility to offer and deliver a Service Region Program to meet regional educational and workforce needs in its primary service region as defined in subsection 2.b.ii.1) and 2) below. Service Region Program Responsibilities are assigned to the Designated Institution in each service region, but may be offered and delivered by Partnering Institutions in accordance with the procedures outlined in this policy.

h. Statewide Program shall mean an educational program identified by the Board to be delivered by a particular institution which meets statewide educational and workforce needs. Lewis-Clark State College, College of Eastern Idaho, North Idaho College, College of Southern Idaho, and College of Western Idaho do not have Statewide Program Responsibilities.

i. Statewide Program Responsibility shall mean an institution's responsibility to offer and deliver a Statewide Program in all regions of the state. Statewide Program

Responsibilities are assigned to a specific institution by the Board, taking into account the degree to which such program is uniquely provided by the institution.

2. Planning and Delivery Process and Requirements

   a. Planning

      i. Three-Year Plan

         The Board staff shall, using the Institution Plans submitted, create and maintain a rolling three (3) year academic plan (Three-Year Plan) which includes all current and proposed institution programs. The Three-Year Plan shall be approved by the Board annually at its August Board meeting.

      ii. Institution Plan

         Each institution shall, in accordance with a template to be developed by the Board's Executive Director or designee, create and submit to Board staff a rolling three (3) year academic plan, to be updated annually, that describes all current and proposed programs and services to be offered in alignment with each institution's Statewide and Service Region Program Responsibilities (the Institution Plan). Institution Plans shall be developed pursuant to a process of collaboration and communication with the other institutions in the state.

         1) Statewide Programs

            Institutions assigned a Statewide Program Responsibility shall plan for and determine the best means to deliver such program. Each institution assigned a Statewide Program Responsibility shall include in its Institution Plan all currently offered and proposed programs necessary to respond to the workforce and educational needs of the state relating to such Statewide Program Responsibilities. Each Institution Plan shall include the following information for proposed Statewide programs:

            a) A description of the Statewide Programs to be delivered throughout the state and the anticipated resources to be employed.

            b) A description of the Statewide Programs to be offered by a Designated or Partnering Institution.

            c) A summary of the Memoranda of Understanding (MOUs), if any, to be entered into with Partnering Institutions pursuant to Subsection 2.b.iii. below.

         2) Service Region Programs

            It is the responsibility of the Designated Institution to plan for and determine the best means to deliver Service Region Programs that respond to the educational and workforce needs of its service region. If, in the course of developing or updating its Institution Plan, the Designated Institution identifies a need for the delivery of a program within its service region, and the Designated Institution is unable to provide the program, then the Designated Institution shall coordinate with a Partnering Institution (including institutions with Statewide Program Responsibilities if applicable) located outside of the service region to deliver the program in the service region.

The Institution Plan developed by a Designated Institution shall include the following:

a) A description of the proposed academic programs to be delivered in the service region, or outside of the service region, by the Designated Institution and the anticipated resources to be employed.

b) A description of proposed programs to be offered in the service region by Partnering Institutions, including any anticipated transition of programs to the Designated Institution.

c) A description of proposed Statewide Programs to be offered in the service region by an institution with Statewide Program Responsibilities, or by the Designated Institution in coordination with the institution holding the Statewide Program Responsibility.

d) A summary of proposed MOU's, if any, to be entered into between the Designated Institution and any Partnering Institutions in accordance with Subsection 2.b.iii. below.

e) A summary of collaborative programs created to meet areas designated as high-need.

3) Institution Plan Updates

Institution Plans shall be updated and submitted to Board staff annually as follows:

a) Preliminary Institution Plans shall be developed according to a template provided by the Board's Executive Director or designee and submitted to the Council for Academic Affairs and Programs (CAAP) for review, discussion and coordination annually in April.

b) Following review by CAAP, Institution Plans shall be submitted to Board staff. Upon submission of the Institution Plans to Board staff, the Board's Executive Director or designee shall review the Institution Plans for the

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purpose of optimizing collaboration and coordination among institutions, ensuring efficient use of resources, and avoiding unnecessary duplication of programs.

c) In the event the Board's Executive Director or designee recommends material changes, he/she shall work with the institutions and then submit those recommendations to CAAP for discussion prior to submission to the Board for inclusion in the Three-Year Plan.

d) The Board's Executive Director or designee shall then provide their recommendations to the Board for enhancements, if any, to the Institution Plans at a subsequent Board meeting. The Board shall approve the Institution Plans annually through the Three-Year Plan submitted by Board staff. Board approval of Institution Plans acts as a roadmap for institutional planning and does not constitute Board approval of a program. Institutions are still required to follow the standard program approval process as identified in Board Policy Section III.G to gain program approval.

b. Delivery of Programs

i. Statewide Program Delivery
The Board has established statewide program responsibilities for the University of Idaho, Boise State University, and Idaho State University. Each institution must assess the need for, and when determined by the assessment, ensure the statewide delivery of educational programs assigned by the Board. A statewide program list consisting of statewide program responsibilities shall be updated by the Board every two years in accordance with a schedule developed by the Executive Director or designee. The program list will be contained in the Board approved three-year plan document and maintained by Board staff.

ii. High-Demand Programs
The Board recognizes that the need for high-demand, high-need programs may require joint delivery by multiple institutions statewide. These high-demand programs must be delivered through collaboration between institutions in order to preserve rural and statewide access. Service region restrictions and primary institution first rights to offer a program do not apply to Board identified high-demand programs. Criteria for statewide program high-demand designation includes, but is not limited to:

1) Idaho Department of Labor data,

2) Idaho industry demand as demonstrated by unfilled positions and industry data,

3) Demonstrated Idaho state needs for programs supporting underserved populations, and

4) Requested by the Board.

An institution wishing to offer a high-demand program that does not have statewide responsibility in the program area must meet the criteria above, have a signed MOU with the Institution with the Statewide Program Responsibility, and the approval of the Board's Executive Director or designee. At that point, the Partnering Institution shall include the program in its Institution Plan. If the Board determines that an emergency need exists for a program that the Institution with Statewide Program Responsibility cannot meet, then upon Board approval the two Institutions shall enter into an MOU for the delivery of such program.

iii. Service Region Program Delivery

The Board has established service regions for the institutions based on the six geographic areas identified in Section 33-2101, Idaho Code. A Designated Institution shall have the Service Region Program Responsibility to assess and ensure the delivery of all educational programs and services necessary to meet the educational and workforce needs within its assigned service region.

1) Academic Service Regions

Region I shall include the area within Area No.1 under Section 33-2101, Idaho Code. Lewis-Clark State College, the University of Idaho, and North Idaho College are the Designated Institutions serving undergraduate needs. The University of Idaho is the Designated Institution serving the graduate education needs. Lewis-Clark State College, and North Idaho College are the Designated Institutions serving applied baccalaureate degree needs.

Region II shall include the area within Area No.2 under Section 33-2101, Idaho Code. Lewis-Clark State College and the University of Idaho are the Designated Institutions serving undergraduate needs. The University of Idaho is the Designated Institution serving the graduate education needs.

Region III shall include the area within Area No.3 under Section 33-2101, Idaho Code. Boise State University and College of Western Idaho are the Designated Institutions serving undergraduate needs. Boise State University is the Designated Institution serving graduate education needs. Boise State University and College of Western Idaho are the Designated Institutions serving applied baccalaureate degree needs.

Region IV shall include the area within Area No.4 under Section 33-2101, Idaho Code. Idaho State University and College of Southern Idaho are the

Designated Institutions serving undergraduate needs. Idaho State University is the Designated Institution serving the graduate education needs, with the exception that Boise State University will meet undergraduate and graduate business program needs. Idaho State University and College of Southern Idaho are the Designated Institutions serving applied baccalaureate degree needs.

Region V shall include the area within Area No.5 under Section 33-2101, Idaho Code. Idaho State University is the Designated Institution serving undergraduate and graduate education needs.

Region VI shall include the area within Area No.6 under Section 33-2101, Idaho Code. Idaho State University and College of Eastern Idaho are the Designated Institutions serving undergraduate education needs. Idaho State University is the Designated Institution serving the graduate education needs. Idaho State University and College of Eastern Idaho are the Designated Institutions serving applied baccalaureate degree needs.

2) Career Technical Service Regions

Postsecondary career technical education is delivered by six (6) institutions, each having responsibility for serving one of the six geographic areas identified in Section 33-2101.

Region I shall include the area within Area No.1 under Section 33-2101, Idaho Code. North Idaho College is the Designated Institution.

Region II shall include the area within Area No.2 under Section 33-2101, Idaho Code. Lewis-Clark State College is the Designated Institution.

Region III shall include the area within Area No.3 under Section 33-2101, Idaho Code. College of Western Idaho is the Designated Institution

Region IV shall include the area within Area No.4 under Section 33-2101, Idaho Code. College of Southern Idaho is the Designated Institution.

Region V shall include the area within Area No.5 under Section 33-2101, Idaho Code. Idaho State University is the Designated Institution.

Region VI shall include the area within Area No.6 under Section 33-2101, Idaho Code. College of Eastern Idaho is the Designated Institution.

3) Program Offerings by Partnering Institutions

If a Partnering Institution (other than an institution with Statewide Program Responsibilities) identifies a Service Region Program not identified, or anticipated to be identified, in a Designated Institution's Plan, and the Partnering Institution wishes to offer such program in the Designated Institution's service region, then the Partnering Institution may communicate with the Designated Institution for the purpose of allowing the Partnering Institution to deliver such program in the service region and to include the program in the Designated Institution's Plan. In order to include the program in the Designated Institution's Plan, the Partnering Institution must demonstrate the need within the service region for delivery of the program, as determined by the Board (or by the Administrator of the Division of Career Technical Education in the case of career technical level programs). In order to demonstrate the need for the delivery of a program in a service region, the Partnering Institution shall complete and submit to the Chief Academic Officer of the Designated Institution, to CAAP and to Board staff, in accordance with a schedule to be developed by the Board's Executive Director or designee, the following:

a) A study of business and workforce trends in the service region indicating anticipated, ongoing demand for the educational program to be provided.

b) A survey of potential students evidencing demand by prospective students and attendance sufficient to justify the short-term and long-term costs of delivery of such program.

c) A complete description of the program requested to be delivered, including a plan for the delivery of the program, a timeline for delivery of the program, the anticipated costs of delivery, the resources and support required for delivery (including facilities needs and costs), and program syllabuses.

iv. Associate Degrees at Universities and Baccalaureate Degrees at Community Colleges

When a university proposes to offer an associate degree or a community college proposes to offer a baccalaureate degree, the Board will evaluate the proposed degree using at least the following criteria:

1) Demand
Proposed offerings must be to meet an urgent, local need based on where students who complete the offering will be employed rather than on where the students reside. The demand for the proposed offering needs to be clear, urgent, and compelling, as evidenced through data and industry input. Commitments of practical support (e.g. funding, internships, etc.) from industry stakeholders constitutes evidence of demand.

2) Specialization
The proposed offering must be based on the unique capability at the institution, founded on specialized instructional expertise and any infrastructure necessary for program delivery.

3) Non-Competitiveness
The proposed offering must be non-competitive with other institutions' offerings within the identified service area (whether regional or statewide) and supported by other institutions within the service area. The Executive Director or designee may request written commitments from the presidents of other institutions within the service area expressing conceptual and, if necessary, practical support for the proposed program.

4) Collaboration
Alternative approaches to meeting the identified demand addressed by the proposed offering should be fully considered, including potential collaboration with other institutions. High-demand programs must be offered through inter-institutional collaboration as described in this policy.

5) Resources
The institution must have sufficient resources to develop and deliver the proposed offering.

These criteria do not apply to Associate Degrees in General Studies currently offered or proposed to be offered by the universities.

v. Memoranda of Understanding

The Board encourages and fosters orderly and productive collaboration between Idaho's public institutions. Memoranda of Understanding can support such collaboration.

Institutions proposing to offer a joint program shall develop an MOU to identify the specific roles of each participating institution; the student-related processes associated with delivery of the program; and a timeline for review.

When an institution desires to offer a program already being offered by another institution in the latter institution's service region, an MOU shall be developed between the institutions to offer the program.

If a Designated Institution has identified a workforce or educational need for the delivery of a program within its service region and is unable to provide the program, the Designated Institution may collaborate with a Partnering Institution to offer the program. An MOU will not be required for review or approval prior to implementation in this case. Institutions are required to follow the standard program approval processes as identified in Board Policy III.G to obtain program approval.

An institution with Statewide Program Responsibility need not enter into an MOU with any other institutions before offering the statewide program in service regions outside the service region of the institution with Statewide Program Responsibility. If an institution desires to offer a program for which another institution has Statewide Program Responsibility, the institution that does not have Statewide Program Responsibility shall be required to enter into an MOU with the institution that has Statewide Program Responsibility for that program.

When an institution with Statewide Program Responsibility or Service Region Program Responsibility desires to offer a program within a service region where such program is currently being offered by another institution, the institutions shall enter into a transition MOU that includes an admissions plan between the institutions providing for continuity in student enrollment during the transition period.

Idaho public postsecondary institutions may enter into MOUs with out-of-state postsecondary institutions or private postsecondary institutions to offer programs. Such MOUs do not require notification or approval by the Board but shall be shared with the Council on Academic Affairs and Programs. While the Board does not prohibit MOUs with out-of-state postsecondary institutions, agreements with in-state public institutions are preferred.

Articulation agreements between any postsecondary institutions for the purposes of facilitating course or program transfer do not require approval by the Board. Such agreements shall be managed and tracked by the institutions and shall be reported to the Board on an annual basis as part of the three-year planning process. All articulation agreements must be in compliance with Section 33-3729, Idaho Code, and Board Policy III.V.

All MOUs shall be submitted in conjunction with related program proposals following the standard program approval processes as identified in Board Policy III.G.

vi. Facilities

For programs offered by a Partnering Institution (whether an institution with Statewide Program Responsibilities, or otherwise) within a municipal or metropolitan area that encompasses the campus of a Designated Institution, the Partnering Institution’s programs offerings shall be conducted in facilities located on the campus of the Designated Institution to the extent the Designated Institution is able to provide adequate and appropriate property or facilities (taking into account financial resources and programmatic considerations), or in facilities immediately adjacent to the campus of the Designated Institution. Renting or building additional facilities shall be allowed

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only upon Board approval, based on the following:

1) The educational and workforce needs of the local community demand a separate facility at a location other than the campus of the Designated Institution or adjacent thereto as demonstrated in a manner similar to that set forth in Subsection 2.b.ii.1) above, and

2) The use or development of such facilities are not inconsistent with the Designated Institution's Plan.

Facilities rented or built by a Partnering Institution (whether an institution with Statewide Program Responsibilities, or otherwise) on, or immediately adjacent to, the "main" campus of a Designated Institution may be identified (by name) as a facility of the Partnering Institution, or, if the facility is rented or built jointly by such institutions, as the joint facility of the Partnering Institution and the Designated Institution. Otherwise, facilities utilized and programs offered by one or more Partnering Institutions within a service region shall be designated as "University Place at (name of municipality)."

For programs offered by a Partnering Institution (whether an institution with Statewide Program Responsibilities, or otherwise) within a municipality or metropolitan area encompassing a campus of a Designated Institution, to the extent programmatically possible, auxiliary services (including, but not limited to, bookstore, conference and other auxiliary enterprise services) and student services (including, but not limited to, library, information technology, and other auxiliary student services) shall be provided by the Designated Institution. To the extent programmatically appropriate, registration services shall also be provided by the Designated Institution. It is the goal of the Board that a uniform system of registration ultimately be developed for all institutions governed by the Board. The Designated Institution shall offer these services to students who are enrolled in programs offered by the Partnering Institution in the same manner, or at an increased level of service, where appropriate, as such services are offered to the Designated Institution's students. An MOU between the Designated Institution and the Partnering Institution shall outline how costs for these services will be allocated.

vii. Duplication of Courses

If courses necessary to complete a Statewide Program are offered by the Designated Institution, they shall be used and articulated into the Statewide Program.

viii. Discontinuance of Programs

Unless otherwise agreed between the applicable institutions pursuant to an MOU, if, for any reason, (i) a Designated Institution offering programs in its service region that supports a Statewide Program of another institution, (ii) a Partnering Institution offering programs in the service region of a Designated Institution, or (iii) an institution holding a Statewide Program Responsibility offering Statewide Programs in the service region of a Designated Institution, wishes to discontinue offering such program(s), it shall use its best efforts to provide the institution with Statewide or Service Region Program Responsibility, as appropriate, at least one (1) year's written notice of withdrawal, and shall also submit the same written notice to the Board and to oversight and advisory councils. In such case, the institution with Statewide or Service Region Program Responsibilities shall carefully evaluate the workforce need associated with such program and determine whether it is appropriate to provide such program. In no event will the institution responsible for the delivery of a Statewide or Service Region Program be required to offer such program (except as otherwise provided herein above).

3. Existing Programs

Programs being offered by a Partnering Institution (whether an institution with Statewide Program Responsibilities, or otherwise) in a service region prior to July 1, 2003, may continue to be offered pursuant to an MOU between the Designated Institution and the Partnering Institution, subject to the transition and notice periods and requirements set forth above.

4. Oversight and Advisory Councils

The Board acknowledges and supports the role of oversight and advisory councils to assist in coordinating, on an ongoing basis, the operational aspects of delivering programs among multiple institutions in a service region, including necessary resources and support and facility services, and the role of such councils in interacting and coordinating with local and regional advisory committees to address and communicate educational needs indicated by such committees. Such interactions and coordination, however, are subject to the terms of the MOU's entered into between the institutions and the policies set forth herein.

5. Resolutions

All disputes relating to items addressed in this policy shall be forwarded to the Board's Executive Director or designee for review. The Board's Executive Director or designee shall prescribe the method for resolution. The Board's Executive Director or designee may forward disputes to CAAP and, if necessary, make recommendations regarding resolution to the Board. The Board will serve as the final arbiter of all disputes.

6. Exceptions

a. This policy is not applicable to programs for which 90% or more of all activity is required or completed online, or dual credit courses for secondary education.

~~a.~~b. This policy is not applicable to face-to-face academic undergraduate and graduate education offered within adult correctional facilities under the jurisdiction of the Idaho Department of Correction.

~~b.~~c. This policy also does not apply to courses and programs specifically contracted to be offered to a private, corporate entity. However, in the event that an institution plans to contract with a private corporate entity (other than private entities in the business of providing educational programs and course) outside of their Service Region, the contracting institution shall notify the Designated Institutions in the Service Region and institutions with Statewide Program Responsibilities, as appropriate. If the corporate entity is located in a municipality that encompasses the campus of a Designated Institution, the Board encourages the contracting institution to include and draw upon the resources of the Designated Institution insomuch as is possible.

SUBJECT

Military General Education Crosswalk Update

REFERENCE

October 2018	Board was presented with an overview of work being done for awarding credit based on prior learning assessments to include the development of an Advanced Placement and College Level Examination Program crosswalk.
December 2018	Board was provided with an overview of the Lumina Adult Promise Project and deliverables to include the development of a statewide articulation for awarding credit for prior learning and military experience.

APPLICABLE STATUTES, RULE OR POLICY

Idaho State Board of Education Governing Policies & Procedures, Section III.L.

BACKGROUND/DISCUSSION

The opportunity for students to earn postsecondary credit(s) by demonstrating requisite knowledge, usually through performance on comprehensive exams or portfolio-based evidence of learning, is generally referred to as a *prior learning assessment* (PLA). PLAs bridge the gap between learning acquired in and outside of postsecondary learning environments while also minimizing the time and cost necessary for earning college-level credentials. Board Policy III.L. provides the minimum requirements for PLAs.

The most popular PLAs include: Advanced Placement (AP), College Level Examination Program (CLEP), academic department challenge exams, and student portfolio evaluation. For active duty military personnel and veterans, the Joint Services Transcript (JST) and DANTES Subject Standardized Tests (DSST) are traditional forms of PLA. Learners who earn credit through PLAs are more likely to persist and graduate in more economical terms.

General Education faculty have reviewed hundreds of military occupations for potential prior learning credits and have made an initial set of recommendations that advisors and transcript evaluators will be able to use at all eight institutions. Board staff will continue to gather potential PLA equivalencies, draw on general education faculty to make recommendations, and disseminate these equivalencies to the institutions for the next two years, then reevaluate this effort.

Currently, campuses are actively building wholistic approaches that better support active military members, veterans, and their families. The general education crosswalk work will continue in close collaboration with these other efforts. The Board will receive an update from the Director of the Veteran Student Services Center at Idaho State University and the VA Certifying Official at the College of Eastern Idaho as they summarize the common services and support provided to veterans and dependents statewide, as well as statistics from the VA Comparison

Tool. Additionally, the Director of the Veteran Services Center at Boise State University will provide the Board with the opportunity to hear veteran student success stories that highlight the effectiveness of the programs and initiatives that are now in place.

IMPACT

For military veterans, the General Education Military Equivalencies Guide provides clear guidelines for military occupational PLA at all eight institutions by recognizing the advanced skills that these learners bring to our institutions.

ATTACHMENTS

Attachment 1 – General Education Military Equivalencies Guide

STAFF COMMENTS AND RECOMMENDATIONS

The General Education Military Equivalencies Guide provides an initial framework to guide advisors and transcript evaluators at each postsecondary institution and complements the broader support for veterans at the public postsecondary institutions.

BOARD ACTION

This item is for informational purposes only.

Idaho State Board of Education

650 W. State Street • Room 307 • Boise, ID • 83702
P.O. Box 83720 • Boise, ID • 83720-0037

Idaho State Board of Education Military Experience Guidance

October 2023

Institutions should assign these equivalencies only after reviewing a student's educational goals. This list is not intended to establish automatic transfer decisions but to provide a guide for consistent advising. Institutions should maximize students' Prior Learning Assessment in accordance with their educational goals and chosen degree path.

Written Communication		
ENGL x101: Writing and Rhetoric I	NV-0504-0001	Information Officer (Course)
Oral Communication		
COMM x101: Fundamentals of Oral Communication	NER-MC-002	Mass Communication Specialist (NEW COURSE); Rate 3 only
Humanistic and Artistic Ways of Knowing		
FREN x101: Elementary French I	AR-0602-0010	French (FR) Special Operations Language Training (SOLT) I (3/04-7/15)
FREN x101: Elementary French I	DD-0602-0107	French Basic
FREN x102: Elementary French II	AR-0602-0010	French (FR) Special Operations Language Training (SOLT) I (3/04-7/15)
FREN x102: Elementary French II	DD-0602-0107	French Basic

GERM x101: Elementary German I	AR-0602-0009	German (GM) Special Operations Language Training (SOLT) I (10/05-7/15)
GERM x102: Elementary German II	AR-0602-0009	German (GM) Special Operations Language Training (SOLT) I (10/05-7/15)
SPAN x101: Elementary Spanish I	AR-0602-0008	Spanish (QB) Special Operations Language Training (SOLT) I (7/04-7/15)
SPAN x101: Elementary Spanish I	DD-0602-0133	Spanish Basic
SPAN x101: Elementary Spanish I	DD-0602-0162	Spanish short basic
SPAN x101: Elementary Spanish I	DD-0602-0222	Spanish Basic
SPAN x102: Elementary Spanish II	AR-0602-0008	Spanish (QB) Special Operations Language Training (SOLT) I (7/04-7/15)
SPAN x102: Elementary Spanish II	DD-0602-0133	Spanish Basic
SPAN x102: Elementary Spanish II	DD-0602-0222	Spanish Basic

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January 2023

SUBJECT

Annual Remediation Report

REFERENCE

December 2017	Board received annual remediation report, pursuant to Board Policy III.S.
December 2018	Board received annual remediation report on the effectiveness of the Complete College Idaho remediation reform efforts as part of the Strategic Planning work session.
October 2019	Board approved first reading of changes to Board Policy III.S. Remedial Education, clarifying student readiness levels.
December 2020	Board approved second reading of changes to Board Policy III.S.

APPLICABLE STATUTES, RULE OR POLICY

Idaho State Board of Education Governing Policies & Procedures, Section III.S.

BACKGROUND/DISCUSSION

Board Policy III.S. Remedial Education requires institutions to report annually to the Board their “success rates in Corequisite support models” and success rates in other “remedial courses” annually. This report is a summary of institutional data submitted to the Office of the State Board of Education, covering remediation success rates through the end of the 2021-2022 academic year.

The Board authorizes three remediation models for use in the public postsecondary institutions for English and Mathematics:

- Corequisite Course or Support Model – Remedial instruction is offered in a designated course taught in the same term and in tandem with the course material for the college level offering, most typically by the same instructor and with a complimentary meeting pattern.
- Embedded Model – Remedial content is delivered during the same classroom setting as the college level course offering. Since this model also enrolls students in the credit-bearing course, it is counted as Corequisite support for the purposes of this report.
- Emporium Model – Remedial content is typically delivered though a self-paced computer lab setting where modules or learning packets are available to the individual student.

In addition to these authorized remediation models, pursuant to Board Policy III.S, “institutions may pilot the use of Alternative delivery models, provided the models are evidence based. Institutions choosing to exercise this pilot option shall notify both the Council on Academic Affairs and Programs and the Instruction, Research, and Student Affairs Committee of their intent to pilot a new delivery model and the results of said pilot. Piloted models must be assessed annually and may be continued and scaled beyond the first year if the pilot achieves equal or greater success rates in students completing gateway mathematics and English courses as compared to rates achieved in approved Corequisite Support models."

While English remediation in the eight public postsecondary institutions in Idaho is now exclusively offered through the Corequisite course model, math remediation is offered though several pedagogical models across the eight institutions, including the Corequisite models, the Emporium model, and Alternative models in pilot. Some institutions still offer Traditional math remediation as they transition to an authorized model as required by Board policy. No institution is implementing an alternative approach to math remediation in a formal pilot, but some institutions offer Math 108, which is considered an alternate form of traditional remediation, except in cases where Math 108 is the required math course for Career Technical Education programs.

IMPACT

This report provides the Board with longitudinal data regarding the success of the remediation models required by policy compared to Traditional remediation approaches in both math and English language arts. The report helps the Board understand the efficacy of this policy in promoting postsecondary student advancement and completion.

ATTACHMENTS

Attachment 1 – Annual Report on Remediation in English and Math in Idaho's Public Postsecondary Institutions

STAFF COMMENTS AND RECOMMENDATIONS

The Corequisite approach is used for first-year writing courses (English) at all eight Idaho public postsecondary institutions. The number of students enrolling in writing Corequisite support courses has declined by 36% over time, and pass rates for students in the Corequisite model are higher (68.2%) than historical pass rates using the now-defunct Traditional model (62.9%).

The support and remediation models are more complex in math as many institutions offer two or more models at the same time, and different support or remediation models may be aligned with different general education math courses. However, the number of students completing all forms of remedial math has declined by 55.6% over time. Across all institutions, pass rates are highest in Corequisite (70.6%) and Hybrid models (78.2%); Hybrid is a variation that provides accelerated, flexible mathematics instruction. At institutions that offer multiple models, the number of students enrolled in each model varies, which could cause variations in pass rates.

The longitudinal data continue to indicate that Corequisite remediation is the most successful model for both math and writing in terms of student pass rates in those courses. This result is bolstered by additional data in the report showing that students who successfully complete a Corequisite course are more likely to pass a subsequent credit-bearing math or English course than students who completed a remedial course using any other model.

Statewide research indicates that pandemic-related learning losses have had an outsized impact on mathematics learning across all grade levels. Institutions are continuing to explore how to best support accepted college students whose mathematics skills seem to indicate that they need substantial support. Mathematics instruction is receiving additional support and attention through a few efforts, including a two-year Board effort to enhance high-impact teaching practices in general education mathematics while also supporting the continued transition to corequisite mathematics courses.

BOARD ACTION

This item is for informational purposes only.

A Report on Remediation in English and Math in Idaho's Public Postsecondary Institutions

Results through the 2021-2022 Academic Year

Submitted to the Idaho State Board of Education
October 2023

Introduction

Idaho State Board of Education Policy III.S. Remedial Education requires institutions to report annually to the board their “success rates in Corequisite support models” and success rates in other “remedial courses” annually. This report is a summary of institutional data submitted to the Office of the State Board of Education, covering remediation success rates through the end of the 2021-2022 academic year.

Board policy authorizes three remediation models for use in the public postsecondary institutions for English and Mathematics:

Corequisite Course or Support Model - Supportive instruction is offered in a designated course taught in the same term and in tandem with the course material for the college level offering, most typically by the same instructor and with a complimentary meeting pattern. Alternatively, supportive content is delivered within the same term as the college level offering, but a regularly scheduled course section offering is not employed.

Embedded Model – Remedial content delivered during the same classroom setting as the college level course offering. Since this model also enrolls students in the credit-bearing course, it is counted as Corequisite support for the purposes of this report.

Emporium Model – Remedial content is delivered though a (most typically) self-paced computer lab setting where modules or learning packets are available to the individual student. Students may complete a remedial course or may advance to a credit-bearing course within the semester.

In addition to these authorized remediation models, per Board policy, “institutions may pilot the use of Alternative delivery models, provided the models are evidence-based.”

English support in the eight public postsecondary institutions in Idaho is now exclusively offered through the Corequisite course model.

Math remediation is offered though several pedagogical models across the eight institutions, including the Corequisite models, the Emporium model, Alternative models in pilot (Hybrid), and Traditional remedial courses. For the purposes of this report, pre-general education mathematics courses are defined as Traditional remediation if it meets the first definition of remediation in Board Policy III.S: a “course where credits earned may not apply toward the general education requirements for a certificate or degree”[1].

[1] SBOE Policy III.S

1 ENGLISH COREQUISITE INSTRUCTION

Most Idaho institutions began piloting or fully implementing Corequisite courses in 2012-2013. Since 2019, first-year writing support at all of Idaho's eight public postsecondary institutions has been offered exclusively through the Corequisite course. Each institution offers a Corequisite course that is either one or two additional credits (named English 101 Plus, or x101P), and these course credits count toward general education and/or elective credit. These courses are not remedial in pedagogical approach or curriculum.

1.1 ENGLISH COREQUISITE ENROLLMENT PATTERNS

Student enrollment patterns have shifted as institutions introduced and fully scaled the Corequisite model for English. Table 1 describes the total number of student enrollments in Corequisite courses at each community college (bolded) with earlier years including the traditional offerings. Table 2 portrays the same information for four-year institutions. Table 3 documents the increase over time in the number of students placing directly in to the credit-bearing course and the parallel 36% drop in student enrollment in the Corequisite course.

Table 1. Corequisite English enrollment patterns at community colleges.

	2014	2015	2016	2017	2018	2019	2020	2021	2022
CEI	**5**	**12**	**5**	**21**	**27**	**77**	**114**	**110**	**83**
Corequisite	5	12	5	21	27	77	114	110	83
CSI	**581**	**321**	**349**	**319**	**233**	**199**	**194**	**139**	**93**
Corequisite		80	327	315	233	199	194	139	93
Traditional	581	241	22	4					
CWI	**552**	**604**	**770**	**761**	**632**	**463**	**523**	**417**	**522**
Corequisite	285	604	770	761	632	463	523	417	522
Traditional	267								
NIC	**436**	**324**	**361**	**346**	**344**	**231**	**224**	**189**	**153**
Corequisite		53	244	233	264	231	224	189	153
Traditional	436	271	117	113	80				

Table 2. Corequisite English enrollment patterns at four-year institutions.

	2014	2015	2016	2017	2018	2019	2020	2021	2022
UI	**266**	**246**	**247**	**227**	**244**	**248**	**276**	**289**	**273**
Corequisite		246	247	227	244	248	276	289	273
Traditional	266								
BSU	**224**	**298**	**277**	**287**	**322**	**303**	**290**	**261**	**287**
Corequisite	224	298	277	287	322	303	290	261	287
ISU	**702**	**810**	**415**	**421**	**553**	**620**	**253**	**195**	**205**
Corequisite	25	51	390	421	553	620	253	195	205
Traditional	677	759	25						
LCSC	**163**	**268**	**207**	**286**	**261**		**267**	**232**	**265**
Corequisite	163	268	207	286	261		267	232	265

Table 3. Total English Corequisite support and traditional remediation enrollments over time, all institutions.

	2014	2015	2016	2017	2018	2019	2020	2021	2022
number of students	2929	2883	2631	2668	2616	2141	2141	1832	1881

1.2 English Corequisite Course Pass Rates

Pass rates in the Corequisite model are higher than historical pass rates from earlier years when a Traditional model was used, with an overall average pass rate of 68.2% in the Corequisite model compared to 61.3% in the Traditional model across all institutions and years (Table 4 and Figure 1).

Table 4. Average Corequisite and traditional course pass rate across all institutions. Note: the only model offered since 2019 is credit-bearing Corequisite coursework.

	Corequisite	Traditional
2014	65.2%	60.8%
2015	66.2%	61.9%
2016	69.4%	64.0%
2017	70.7%	63.2%
2018	67.2%	57.5%
2019	71.1%	*
2020	68.1%	*
2021	63.9%	*
2022	67.6%	*
average of averages	**68.2%**	**61.3%**

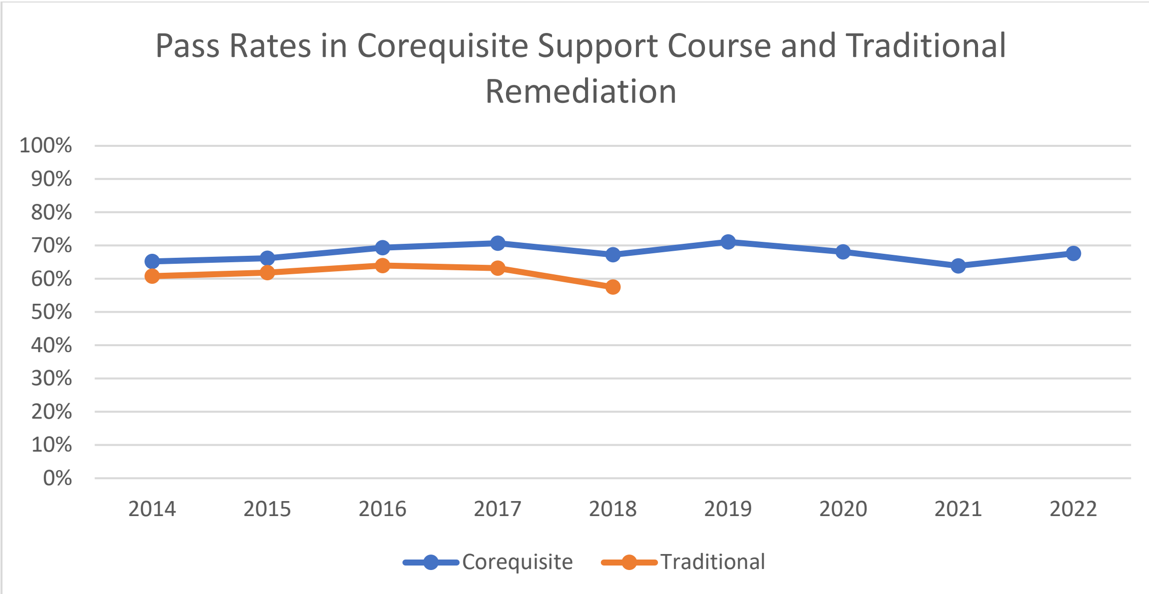


Figure 1. Average English pass rates in Corequisite courses and traditional remediation.

Table 5. English Corequisite course pass rates by institution. Asterisk indicates Corequisite not yet implemented.

	UI	**BSU**	**LCSC**	**ISU**	**CEI**	**CSI**	**CWI**	**NIC**
2014	*	88.4%	68.7%	76.0	80.0%	*	64.9%	*
2015	83.7%	83.2%	75.4%	80.4	*66.7%	77.5%	65.2%	60.4%
2016	87.0%	83.0%	78.7%	76.7%	60.0%	69.4%	71.9%	61.5%
2017	92.1%	87.5%	73.4%	68.4%	85.7%	73.7%	69.9%	67.8%
2018	86.9%	87.3%	46.0%	71.2%	77.8%	70.4%	68.2%	61.0%
2019	81.0%	87.1%	81.8%	66.0%	85.7%	75.4%	68.9%	66.7%
2020	82.6%	84.8%	74.2%	55.7%	79.8%	72.7%	69.0%	55.8%
2021	80.3%	78.9%	62.9%	60.5%	80.9%	68.3%	60%	59.3%
2022	79.5%	80.8%	60.8%	62.9%	73.5%	77.4%	63.2%	73.2%

Figure 2. English Corequisite course pass rates, community colleges.

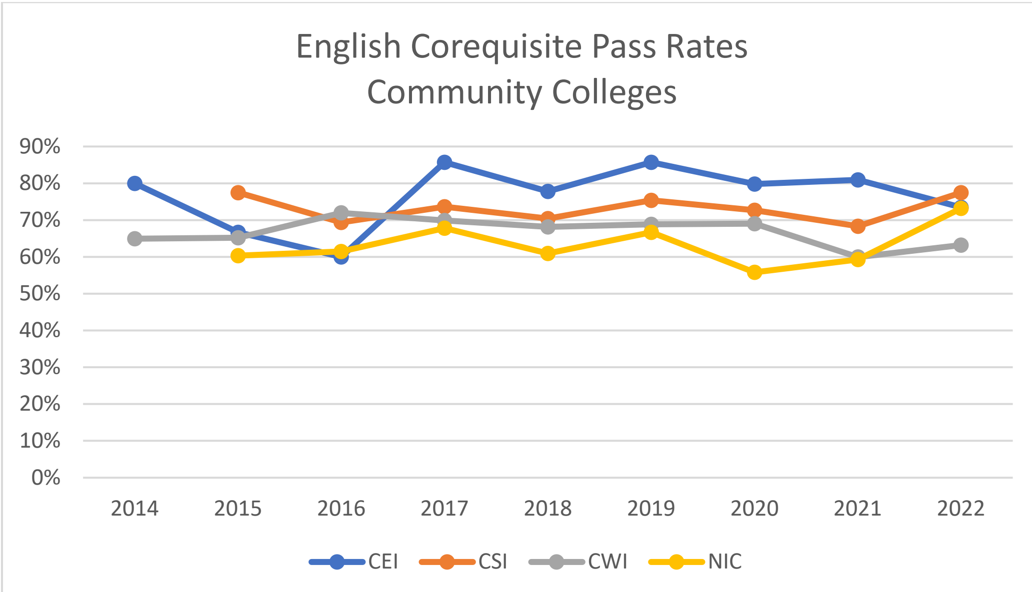
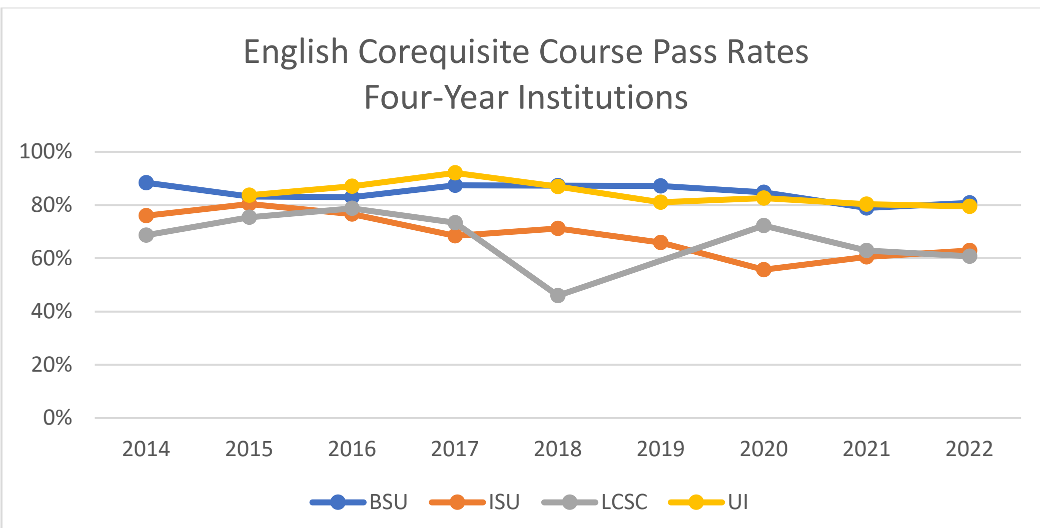


Figure 3. English Corequisite course pass rates, four-year institutions.



1.3 English General Education Course Completion Within One Year

Across all institutions and years, nearly all students who completed a Corequisite writing course also completed their general education writing course because students are enrolled in the general education course simultaneously (Figures 4 and 5). There are a few exceptions at some institutions where the credit for the Corequisite and the general education course are assigned separately[2]. However, when they pass, students nearly always pass both courses.

Figure 4. Rates of students completing a college-level English course within one year of Corequisite at community colleges.

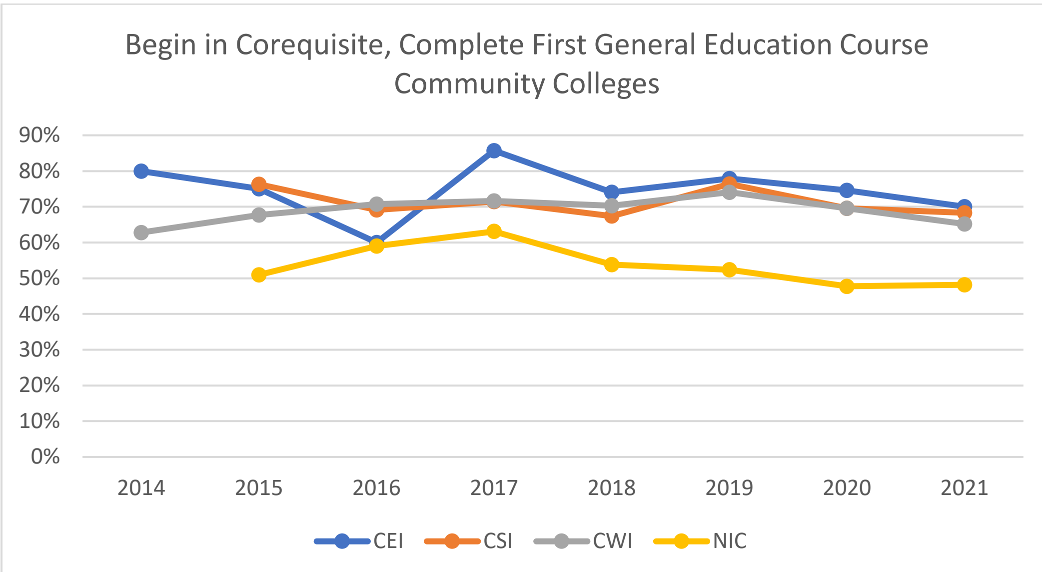
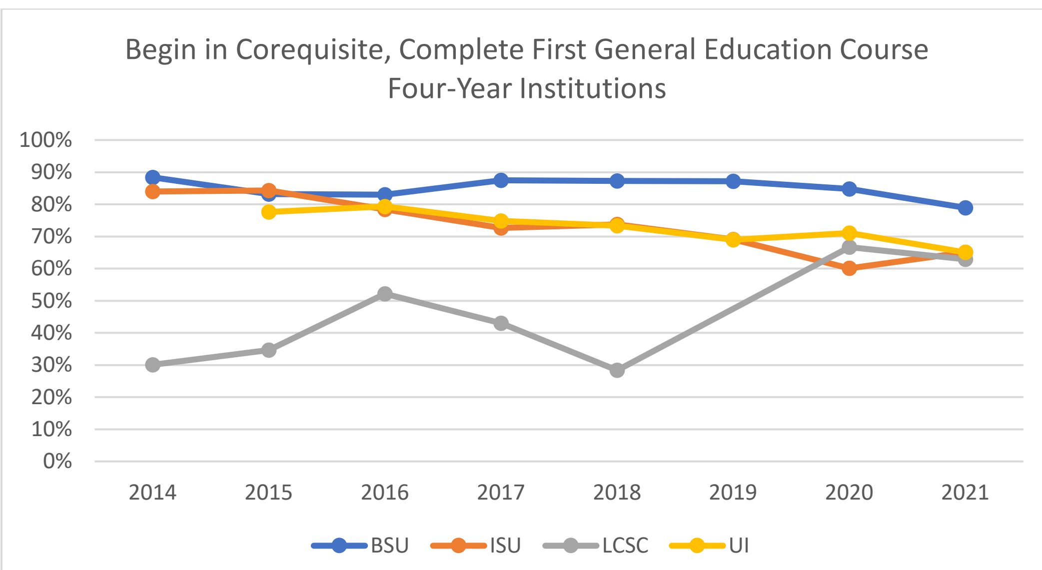


Figure 5. Rates of students completing a college-level English course within one year of Corequisite at four-year institutions.



[2] At some institutions, a Corequisite student enrolls in the following: English 100 (2 cr) + English 101 (3 cr). In rare cases, a student could pass one course but not the other. At other institutions, the Corequisite course is a single general education course, and students pass (or do not pass) the general education course: for example: English 101P (4 cr).

2 MATH REMEDIATION

Math remediation at Idaho's eight public postsecondary institutions is offered through several models, including Corequisite, Emporium, Other (Hybrid), and Traditional, as described below. Most institutions employ more than one model.

Boise State University offers a modified Corequisite approach to their remediation program, identified in this report as Hybrid. While Boise State offers courses that initially appear to be Traditional math courses (Math 103 and Math 108), students spend one day per week in a math computer lab and another day spent on group work focusing on the practical application of mathematics. Additionally, many students are accelerated into higher level courses at varying points in the term and provided non-credit bearing Corequisite support.

University of Idaho offers remediation through an Emporium model with the core content built on Math 108 Intermediate Algebra. Math 108 course work is self-paced, weekly time commitment is required and group meetings, covering study materials and course explanations, are also required.

Idaho State University offers Traditional math remediation (Math 015, Math 0025, and Math 0090, a self-paced alternative), as well as enrollment in Math 108 (locally 1108) Intermediate Algebra, which allows progression into Math 143 (1143) College Algebra. The institution has also recently added the Corequisite course model.

Lewis-Clark State College offers both Corequisite courses and Traditional remediation through Math 015 and Math 025. The school began offerings in Corequisite math in 2017.

College of Western Idaho offers both Emporium and Corequisite courses. Within the Emporium model, modular learning content is offered that encompass preparatory outcomes of various college level courses. Group sessions are offered but not required and weekly time allotments are not required. Students can complete remediation over two semesters (Math 097 (three credits) and 098 (two credits), or in one semester (Math 099, five credits). The school began offerings in Corequisite math in 2017.

College of Southern Idaho offers both Corequisite courses and Traditional remediation through Math 023 Mathematic for College Readiness and Math 043 Algebra for College Readiness. The school began offerings in Corequisite math in 2017.

North Idaho College offers Traditional math remediation (Math 015, Math 025 and Math 090), as well as enrollment in the Alternative Math 108 model, which allows progression into Math 130 Finite Mathematics and Math 143 College Algebra.

College of Eastern Idaho offers remediation through Traditional methodologies (Math 108) and Corequisite courses.

Institutions do not uniformly identify the subject matter of Math 108 as remedial. However, the course does not fulfill a general education requirement and therefore does not count toward a student's degree path. For the purposes of this report, Math 108, Corequisite remedial math (support + remedial course), and remedial math (all pre-general education mathematics) are classified as Traditional remediation because they do not fulfill a general education mathematics requirement. Additionally, with this data set, it is not possible to delineate hybrid-general education math and hybrid remedial math in this data, and so both are labeled Hybrid in this report. Similarly, emporium-general education math and emporium-remedial math are both labeled Emporium. There are nuances with these models that this report cannot capture.

The State Board of Education's Common Course List for general education was used to delineate pre-general education math course remediation from Corequisite math support (Corequisite or hybrid, credit or non-credit-bearing, but offered alongside the general education math course).

2.1 Mathematics Remediation Student Enrollment

Student enrollment patterns have shifted as institutions introduce and support different models. Table 6 describes the total number of student enrollments in remedial mathematics at each community college (bolded) and then the number enrolled in each model offered each year. Table 7 portrays the same information for four-year institutions.

Table 6. Remedial mathematics enrollment patterns at community colleges.

	2014	2015	2016	2017	2018	2019	2020	2021	2022
CEI	**118**	**106**	**176**	**182**	**196**	**349**	**259**	**304**	**273**
Corequisite	6	27	17	15	0	10	30	82	162
Traditional	112	79	159	167	196	339	229	222	111
CSI	**2440**	**911**	**814**	**897**	**740**	**795**	**726**	**541**	**374**
Accelerated				897	721	677	625	431	267
Corequisite					19	118	101	110	107
Other (Hybrid)	874								
Traditional	1566	911	814						
CWI	**2102**	**2634**	**2110**	**1588**	**1761**	**1601**	**1671**	**1347**	**1229**
Corequisite				19	138	193	237	191	181
Emporium			1964	1569	1623	1408	1434	1156	1048
Traditional	2102	2634	146						
NIC	**1471**	**1256**	**989**	**930**	**690**	**553**	**471**	**429**	**395**
Math 108	251	300	180	204	163	160	140	109	108
Co-Remedial						225	191	169	153
Traditional	1220	956	809	726	527	168	140	151	134

Table 7. Remedial mathematics enrollment patterns at four-year institutions.

	2014	2015	2016	2017	2018	2019	2020	2021	2022
UI	**724**	**659**	**651**	**680**	**642**	**573**	**530**	**476**	**602**
Emporium	724	659	651	680	642	573	530	476	602
BSU	**1677**	**1762**	**1688**	**1618**	**1344**	**1219**	**1093**	**461**	**750**
Other (Hybrid)	1677	1762	1688	1618	1344	1219	1093	461	750
ISU	**1439**	**1409**	**1112**	**902**	**1005**	**878**	**685**	**674**	**655**
Math 108	501	497	577	497	542	495	342	228	189
Accelerated/ Emporium					97	291	239	141	126
Corequisite							94	305	340
Traditional	938	912	535	405	366	92	10		
LCSC	**324**	**521**	**426**	**423**	**480**		**362**	**313**	**296**
Corequisite					111		188	183	140
Traditional	324	521	426	423	369		174	130	156

Across all institutions, the number of students enrolling in remedial instruction has declined by 55.6% in eight years (Table 8).

Table 8. Total mathematics remedial enrollments over time, all institutions.

	2014	2015	2016	2017	2018	2019	2020	2021	2022
Number of students	10295	9258	7966	7220	6858	5968	5797	4545	4574

2.2 Mathematics Remediation Model Pass Rates

Across institutions, pass rates in the Corequisite model are higher than pass rates using any other model (Table 9 and Figure 8). Remediation pass rates for each two-year institutions across all years and all models are shown in Table 10; pass rates for four-year institutions are shown in Table 11.

Table 9. Average pass rates over time, 4 models. Note that Traditional includes all pre-general education remediation, Emporium and Hybrid may include remedial or general education math, and Corequisite is a general education math support approach.

	Traditional Remediation	Emporium	Hybrid	Corequisite
2014	54.9%	68.5%	77.6%	83.3%
2015	57.8%	68.0%	80.5%	85.2%
2016	61.6%	50.5%	81.0%	88.2%
2017	60.5%	53.2%	79.7%	91.2%
2018	61.4%	53.9%	80.2%	79.5%
2019	59.0%	59.0%	79.6%	77.3%
2020	61.5%	61.5%	79.5%	73.4%
2021	59.8%	59.8%	84.2%	68.4%
2022	56.2%	56.2%	86.1%	68.2%
total	**59.3%**	**59.3%**	**78.2%**	**70.6%**

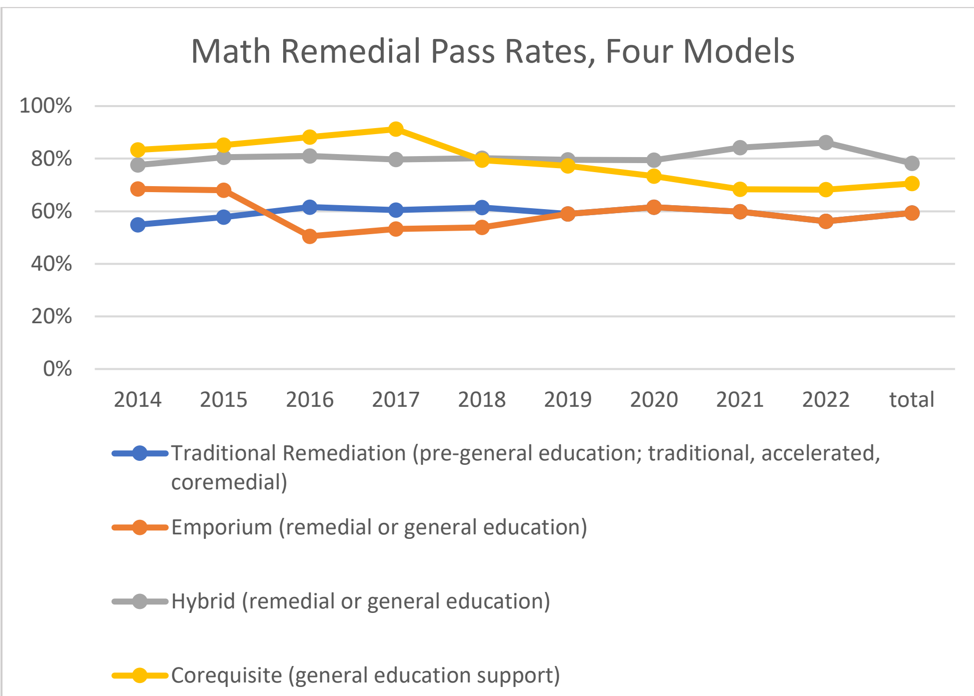


Figure 8. Average pass rates for all remediation models, across all institutions.

Table 10. Math remediation pass rates, community colleges. Asterisk indicates model not implemented or used; double asterisk indicates that the institution transitioned from traditional remediation to accelerated remediation (still pre-general education coursework).

	CEI		CSI		CWI			NIC
	Traditional	Corequisite	Traditional**	Corequisite	Traditional	Emporium	Corequisite	Traditional**
2014	60.7%	83.3%	57.8%	*	51.2%	*	*	54.9%
2015	65.8%	85.2%	66.2%	*	55.7%	*	*	58.5%
2016	81.1%	88.2%	58.6%	*	68.5%	37.2%	*	60.9%
2017	74.3%	100.0%	66.2%	*	*	39.5%	84.2%	65.8%
2018	67.9%	*	69.3%	89.5%	*	44.7%	75.4%	61.2%
2019	62.8%	70.0%	67.8%	81.4%	*	42.8%	75.1%	61.5%
2020	62.0%	83.3%	68.3%	82.2%	*	41.4%	80.6%	64.1%
2021	72.1%	82.9%	70.1%	80.9%	*	47.1%	75.9%	54.1%
2022	77.5%	74.1%	56.2%	73.8%	*	44.0%	71.8%	57.7%

Table 11. Math remediation pass rates, four-year institutions.

	UI	BSU	LCSC		ISU	
	Emporium	Hybrid	Traditional	Corequisite	Traditional	Corequisite
2014	68.5%	79.6%	58.3%	*	54.6%	*
2015	68.0%	80.5%	65.8%	*	57.1%	*
2016	63.7%	81.0%	67.6%	*	61.2%	*
2017	66.9%	79.6%	60.3%	*	58.0%	*
2018	63.1%	79.6%	62.3%	82.0%	57.1%	*
2019	66.8%	80.5%	64.9%	68.1%	54.9%	60.6%
2020	68.7%	81.0%	61.5%	66.7%	54.7%	60.6%
2021	65.1%	79.6%	58.3%	76.4%	61.1%	52.8%
2022	53.0%	86.1%	63.0%	72.0%	50.4%	57.9%

2.3 Mathematics General Education Course Completion Within One Year

In addition to pass rates in Math remediation courses, institutions also reported completion rates (C- or better) in a subsequent college-level math course within one year of taking a remedial course. This data includes students who were unsuccessful or who dropped out prior to attempting the subsequent course. Across all institutions and years, students who took Corequisite remediation had higher completion rates in subsequent college-level math courses than students who took any other type of remedial model (Tables 12-14 and Figures 9-11).

Table 12. Average of averages completing general education math in a year.

	Traditional Remediation pre-Gen Ed	**Emporium** Remedial (pre) or Gen Ed Support	**Hybrid** Remedial (pre) or Gen Ed Support	**Corequisite** Gen Ed Support
2014	27.3%	50.4%	42.8%	83.3%
2015	27.2%	50.2%	55.1%	92.6%
2016	32.3%	29.7%	58.4%	82.4%
2017	30.3%	34.4%	57.4%	88.2%
2018	30.2%	34.7%	55.8%	76.3%
2019	26.0%	36.4%	56.7%	78.2%
2020	28.6%	36.9%	58.6%	72.3%
2021	30.9%	35.8%	65.1%	69.2%
Total	**26.9%**	**34.2%**	**45.4%**	**71.7%**

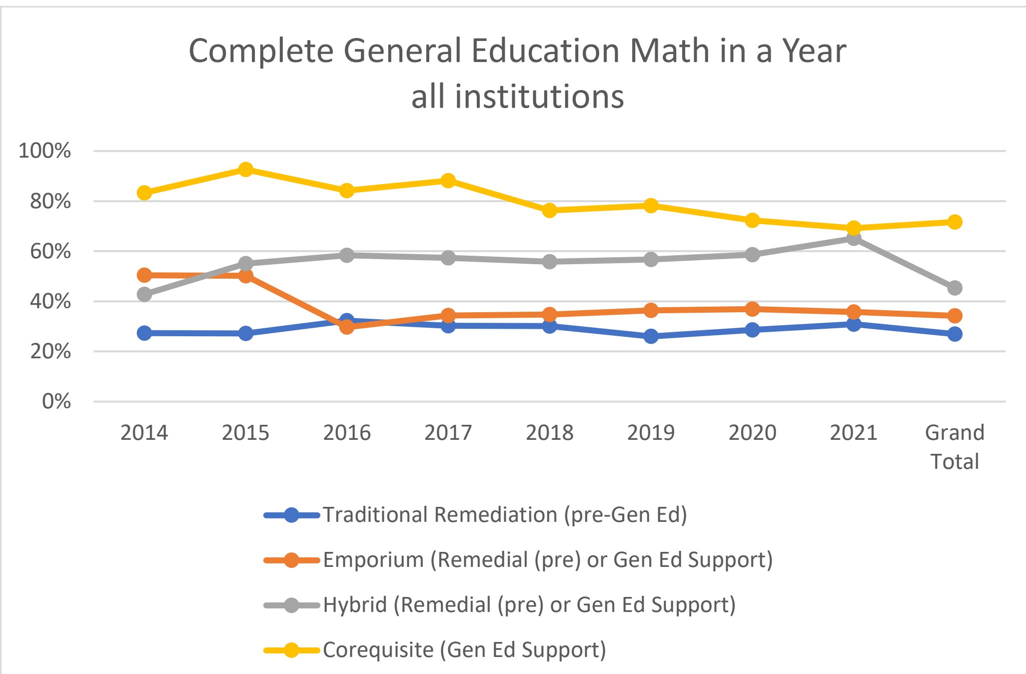


Figure 9. Average number completing general education math in a year, all institutions.

Table 13. Average number of students completing general education math in a year, community colleges.

	Traditional Remediation pre-Gen Ed	**Emporium** Remedial (pre) or Gen Ed Support	**Corequisite** Gen Ed Support
2014	25.6%	*	83.3%
2015	25.5%	*	92.6%
2016	31.5%	9.4%	82.4%
2017	31.9%	16.8%	88.2%
2018	37.0%	19.4%	70.7%
2019	32.2%	20.5%	78.2%
2020	34.4%	17.3%	76.1%
2021	37.3%	23.2%	76.2%
Total	**29.7%**	**17.1%**	**76.8%**

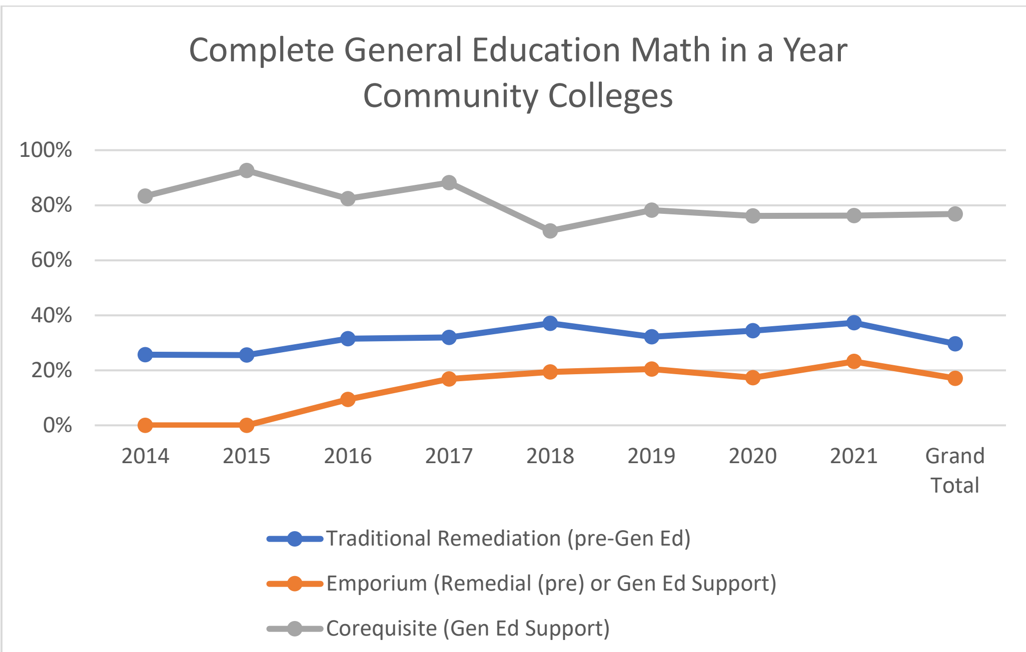


Figure 10. Average number of students completing general education in a year, community colleges.

Table 14. Average number of students completing general education math in a year at four-year institutions.

	Traditional Remediation pre-Gen Ed	**Emporium** Remedial or Gen Ed Support	**Hybrid** Remedial or Gen Ed Support	**Corequisite** Gen Ed Support
2014	27.3%	50.4%	42.8%	83.3%
2015	27.2%	50.2%	55.1%	92.6%
2016	32.3%	29.7%	58.4%	84.2%
2017	30.3%	34.4%	57.4%	88.2%
2018	30.2%	34.7%	55.8%	76.3%
2019	26.0%	36.4%	56.7%	78.2%
2020	28.6%	36.9%	58.6%	72.3%
2021	30.9%	35.8%	65.1%	69.2%
Total	**26.9%**	**34.2%**	**45.4%**	**71.7%**

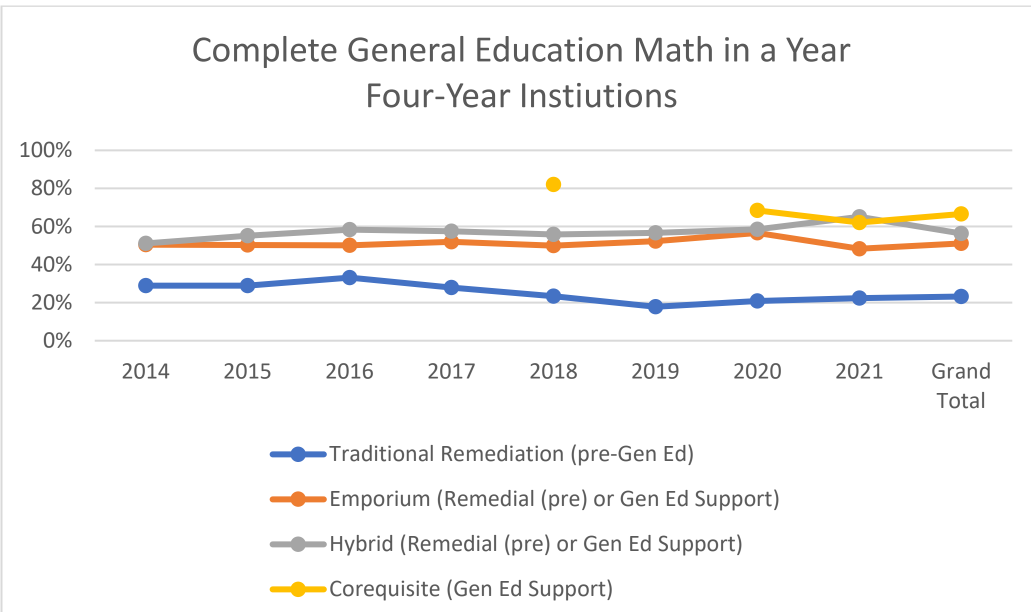


Figure 11. Average number of students completing general education math in a year, four-year institutions.

SUBJECT

Idaho Engineering & Computer Science Needs Assessment & Gap Analysis

APPLICABLE STATUTES, RULE OR POLICY

House Bill 809, Section 4 (2022)

BACKGROUND/DISCUSSION

In 2022, Governor Little recommended, and the legislature appropriated, $100,000 in one-time General Funds for the Office of the State Board of Education to develop a statewide needs assessment for engineering and computer science education in Idaho.

In November 2022, the Office of the State Board of Education entered into a Professional Services Agreement with the Western Interstate Commission for Higher Education (WICHE) to complete the engineering and computer science needs assessment. The scope of the WICHE needs assessment addressed two important questions:

1. Is the supply of engineering and computer science graduates from Idaho's public institutions adequate to meet current and projected industry demand?
2. If not, how can the State strategically address the gap between supply and demand?

WICHE's top level findings from its assessment are twofold:

1. Current Undersupply: The supply of graduates in engineering and computing disciplines (broadly defined) from the states' public institutions does not appear sufficient to meet existing industry needs.
2. Future Supply Constraints: Growing the number of students prepared to enter and succeed in these majors is not as simple as increasing postsecondary capacity. Demographic and educational trends point to, at best, modest growth in the potential pool of students, meaning any effort to increase graduates in these fields must focus on expanding the educational pipeline of students from K–12 to postsecondary education who are interested in and equipped to succeed in these fields.

IMPACT

The report provides findings on opportunities to increase the supply of graduates in engineering and computer science disciplines, as well as potential next steps that the state can take to capitalize on these opportunities.

ATTACHMENTS

Attachment 1 – WICHE Report
Attachment 2 – WICHE Presentation

STAFF COMMENTS AND RECOMMENDATIONS

Industry, education, and government leaders in Idaho have known for some time that the state has a dire need and an undeniable opportunity to grow the number of engineering and computer science programs in support of economic growth and global competitiveness.

The WICHE Engineering & Computer Science Needs Assessment provides an initial framework to guide future decisions regarding the expansion of engineering and computer science programs and initiatives in Idaho.

BOARD ACTION

This item is for informational purposes only.

IF YOU BUILD IT, WILL THEY COME?

Exploring the Possibility of an Idaho Engineering and Computer Science Growth Initiative

WICHE
Western Interstate Commission for Higher Education

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Disclaimer

The research presented here includes information derived from SLDS Data from the Idaho State Board of Education (SBOE) and the Idaho State Department of Education (SDE). Any errors are attributable to WICHE.

Publication Number 1A30002023

IF YOU BUILD IT, WILL THEY COME?

Exploring the Possibility of an Idaho Engineering and Computer Science Growth Initiative

WICHE
Western Interstate Commission for Higher Education

EXECUTIVE SUMMARY

Introduction

In 2022, industry leaders voiced concerns to policymakers that Idaho was not producing enough engineering and computer science graduates from its public institutions to meet the needs of Idaho's economy. These leaders expressed interest in launching an engineering and computer science growth initiative similar to a long-time effort in Utah to address these gaps. In response, the Idaho State Board of Education commissioned an analysis from the Western Interstate Commission for Higher Education (WICHE) to explore the issue. Guided by an industry advisory group, the project team reviewed existing research, analyzed publicly available data as well as data from the state's longitudinal data system, modeled the projected supply of graduates, and conducted a range of employer engagement activities to answer two key questions:

1. Is the supply of engineering and computer science graduates from Idaho's public institutions adequate to meet current and projected industry demand?
2. If not, how can the state strategically address the gap between supply and demand?

This analysis was not intended to provide a complete and detailed strategic plan, but rather to assist industry with articulating the gap between supply and demand to the greatest extent possible and identifying high-level, evidence-based approaches to increase credential production. Importantly, these potential approaches are tailored to fit Idaho's context and trends in population growth, demographics, and student flow.

Key Findings

Our analysis concludes the following, based on the best available evidence:

1. **Current Undersupply**: The supply of graduates in engineering and computing disciplines (broadly defined) from the states' public institutions does not appear sufficient to meet existing industry needs.

2. **Future Supply Constraints**: Growing the number of students prepared to enter and succeed in these majors is not as simple as increasing postsecondary capacity. Demographic and educational trends point to at best modest growth in the potential pool of students, meaning any effort to increase graduates in these fields must focus on expanding the educational pipeline of students from K–12 to postsecondary education who are interested in and equipped to succeed in these fields.

A coordinated, industry-led approach to developing a shared vision and action plan to address these nuanced, multifaceted challenges will be an important next step. It is important to recognize that because of the challenges in future demographics and the state's trends in education outcomes, this work will likely be more challenging than Utah's initiative.

Approach

No data source exactly quantifies the hiring demand for recent graduates in Idaho's labor market, nor the available supply of graduates planning to work in Idaho. This report relies instead on a combination of qualitative work, data analysis, and review of existing research to identify proxy metrics for supply and demand where possible and includes discussion of the strengths and limitations of this approach, potential gaps in information, and further questions. WICHE conducted a survey of key employers and industry leaders to gather their perspectives and additional data that is highly relevant to this report. WICHE also received invaluable guidance, counsel, and feedback from a core team of industry advisors drawn from across the state.

Understanding Supply

institutions are used as a proxy metric for the "supply" of new workers available to the state's businesses. The term "computer science" as used in the Utah initiative refers to a wide range of computer-related degrees, thus the term computer science has been adjusted to computer and information science in this report to more accurately reflect the range of degree types discussed. Similarly, both engineering and engineering technology programs were considered at the suggestion of Idaho's industry leaders that advised WICHE on this analysis. For some analyses, the limited number of individuals who enroll in and graduate with degrees in engineering technology make it impractical to present detailed data. Finally, the contributions of the state's private institutions are reflected where appropriate to provide a more complete picture of available supply.

A model of student flow through the education pipeline was used to examine how improvements on certain metrics, such as high school graduation rates, college go-on rates, or progression through postsecondary education would impact the number of graduates produced in the three fields of interest. The results and takeaways from this model are described briefly below and in greater detail in the full report.

Of course, postsecondary graduates are not the only source of supply in the labor market. Employers need to hire across a range of experience levels, some Idaho businesses hire from regional, national, or international candidate pools, and net migration also affects labor supply. However, qualitative research demonstrates robust employer demand for entry-level hires in the fields of interest — typically bachelor's graduates — as well as a strong employer preference for hiring Idaho graduates.[1] Therefore, degree production in engineering and computer and information science fields presents a useful, though imperfect, way to think about workforce supply.

Estimating Demand

The Bureau of Labor Statistics (BLS) offers historical estimates of employment by occupation at the national and the state level, allowing for cross-state comparisons. BLS also produces projections of employment by occupation, but only at the national level. The Idaho Department of Labor (ID DoL) produces state-level projections of employment by occupation, which provide the best available state-level projections of hiring demand by occupation despite certain limitations. For example, the 2020–2030 ID DoL projections do not yet reflect the projected impacts of significant federal policy changes such as the CHIPS and Science Act (CHIPS Act) and the Infrastructure Investment and Jobs Act (IIJA). The project team supplemented the existing ID DoL projections with results from a 2023 employer survey on hiring demand in fields of interest and in-depth interviews with a subset of industry representatives.

Engineering & Engineering Technologies

Degree production and projected job demand in related fields are not a one-to-one match, but comparing the approximate magnitude of the difference between the two does provide some sense of the "gap" that exists between supply and demand. Meanwhile, examining projections based on current trends offers a way to understand whether identified gaps are likely to grow or to shrink if present trends continue.

Engineering and Engineering Technologies Supply

Historical trends in Idaho's engineering bachelor's degree production — the typical entry-level credential of most engineering professions[2] — show growth between 2010 and 2020, primarily driven by substantial growth between 2010 and 2015. Supply modeling shows that if contributing trends persist, Idaho can expect only minimal increases in the number of engineering and engineering technology graduates produced annually by its public institutions. A projected levelling off of the overall number of high school graduates in the state and a negatively trending college go-on rate of Idaho high school graduates are among the primary contributors to this low growth projection.[3]

Meanwhile, existing research shows that just over 60% of engineering bachelor's degree recipients who were Idaho residents at the state's public institutions work in Idaho after graduation, and under 40% of out-of-state students do (including international students, who are over-represented in engineering programs). In engineering technology, 74% of in-state associate degree holders stay in the state and 35% of out-of-state students remain in the state to work.[4] As a result, the number of graduates produced by the state's public institutions may under-represent the available workforce supply.

Importantly, data analysis also revealed that women are significantly less likely to select engineering majors even when controlling for factors like scores on math standardized tests. However, women that do so are more likely to complete their degrees. Strong performance on high school math standardized exams is also positively associated with choosing engineering as a major and completing a degree in the field. As is discussed later, developing and implementing strategies to welcome women into these fields may be productive as the gender disparities hold true even when controlling for math performance, meaning women with strong math results are still much less likely to enter into engineering as a major.

Engineering and Engineering Technologies Demand

Trends in Idaho's engineering job growth show increases over the past decade, at similar rates as surrounding states. Looking forward, there are moderate increases of about 5% nationally between 2021 and 2031 projected for engineering as an occupational field with even more robust growth projected in Idaho — more than 17% between 2020 and 2030. Growth in Idaho's engineering technology occupations is also expected to outpace the national number, growing by more than 13% in the state between 2020 and 2030 compared to 1.4% nationally between 2021 and 2031. According to the ID DoL, engineering can expect to see 984 job openings per year due to turnover and growth between now and 2030, while engineering technology is projected to see 227 annual openings.[5]

However, more recent developments suggest that this may be an underestimate. One engineering industry group estimates that projects funded by the IIJA alone will increase the need for engineers nationally by 82,000 and notes that these increases will affect every state.[6]

> *"If we were able to fill all our positions, we'd be able to get more revenue in and more clients and we'd then have demand for more engineers… we've been stifled by an inability to find people to do the work, we have more work than we have people to do."*
>
> – Idaho Engineering Employer

The employer survey conducted for this project provides further evidence that the 2020–2030 projections may underestimate demand. Respondents estimated that they are trying to hire nearly 2,000 employees with degrees in engineering and engineering technology within the next 12 months alone, almost double the DoL projected average annual openings. Further, 77% of respondents noted that they are currently struggling to fill jobs that require degrees in engineering and engineering technology fields. While the employer survey sample was not representative of Idaho as a state, the table below illustrates respondents' self-reported number of Idaho-based engineering and computer-related employees compared to state estimates of total employment within these occupations to provide some sense of the coverage offered by the survey.

Employer Survey Respondent Engineering Employees in Idaho Compared to Overall Number of State Engineering Employees.

	STATE TOTAL 2020	STATE TOTAL 2023 (Estimated)	SURVEYED COMPANIES (Estimated)*
Engineering Occupations (17–2000)	10,321	10,892	6,478

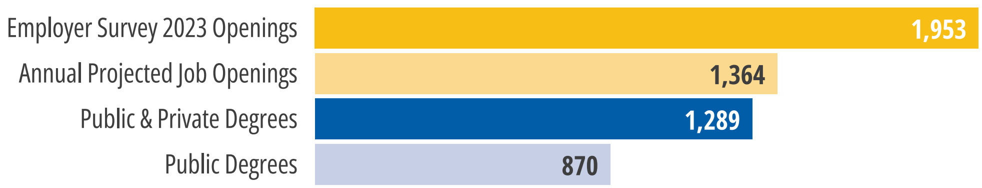
**Survey response options were presented as ranges and these totals assume a midpoint value of the selected range.*

Another key factor to consider is that workforce shortages in the short term may suppress future workforce demand. For example, according to Idaho employers interviewed, the undersupply of engineering candidates is already curtailing business growth opportunities or leading them to develop that business elsewhere. Existing undersupply has already dampened hiring demand, whereas increases in engineer supply could potentially enable business growth and expand hiring demand.

Engineering and Engineering Technologies Gap Analysis

The available quantifications of supply and demand indicate a gap between the number of engineering and engineering technology graduates of all degree types from Idaho public institutions (as depicted by the blue bars in the figure below) and the needs of Idaho's employers (as depicted by the yellow bars in the figure below). While the magnitude of the gap differs depending on the exact specifications used (whether graduates from private institutions are included, if migration is accounted for, etc.) the gap appears significant — particularly considering the likely undercount represented by the demand numbers — and likely to continue over time if present trends continue.

Idaho Institution Annual Engineering & Engineering Technology Degrees Produced (Average of 2018–2020), ID DoL Projected Annual Engineering & Engineering Technologist Job Openings (2020–2030) & WICHE Employer Survey Hiring Demand Estimates (2023)



Sources: Integrated Postsecondary Education Data System, Idaho Department of Labor Occupation Projections (2020–2030), WICHE Employer Survey

Computer & Information Science

Degree production and projected job demand in related fields are not a one-to-one match, but comparing the approximate magnitude of the difference between the two does provide some sense of the "gap" that exists between supply and demand. Meanwhile, examining projections based on current trends offers a way to understand whether identified gaps are likely to grow or to shrink if present trends continue.

Computer and Information Science Supply

The National Center for Education Statistics designates computer and information science degrees as Classification of Instructional Programs (CIP) 11: "Computer and Information Science and Support Services: Instructional programs that focus on the computer and information sciences and prepare individuals for various occupations in information technology and computer operations fields."[7] Similar to engineering, historical trends in computer and information science degree production at the bachelor's level in Idaho — also the typical entry-level credential for many in-demand computer-related professions[8] — show growth between 2010 and 2020, primarily driven by substantial increase between 2010 and 2015. Supply modeling shows that if contributing trends persist, Idaho can expect only minimal increases in the number of computer and information science graduates produced annually by its public institutions.

Research shows that a relatively high percentage of computer and information science public institution graduates stay in Idaho, with over 70% of in-state bachelor's graduates employed in the state after graduation and over 50% of out-of-state graduates.

Additionally, WICHE's pipeline analysis using student-level data finds stark gender gaps in the likelihood of declaring Computer and Information Sciences as a major, as well as completing degrees in this field, even when controlling for math scores and other characteristics. This analysis also showed the importance of K–12 math preparation, with results of standardized high school math tests being strongly associated with entrance into and success in this field in college. This last finding should not be surprising as it is supported by substantial other research as well as the perspectives of industry leaders.

Computer and Information Science Demand

The range of computer occupations continues to evolve, with the current BLS definitions including occupations ranging from computer scientists to web developers to network administrators. Trends in computer-related job growth show a fairly dramatic increase between 2010 and 2021 as computer and information technology related roles became ubiquitous across industries. Idaho's occupational growth trends in a similar way to its neighboring states, though it has continued to lag slightly behind them over the past decade (Washington has long dominated in the overall amount of employment in computer occupations, though Utah's growth trajectory has been the steepest over this period).[9]

> ***"We've not necessarily tried to materially increase our hiring in the state of Idaho… we just found that it was too challenging to find enough candidates locally. So, we diversified our locations in order to fulfill that [need]."***
> *– Tech Sector Employer*

In terms of projections, computing occupational fields are projected to increase 14.6% nationally between 2021–31 and 12.2% between 2020–30 in Idaho. The ID DoL estimates that there will be 1,387 annual job openings in the field in Idaho between now and 2030.[10]

Because the projection methodology does not project shifts in industry mix, it may underestimate possible demand. That is, certain industries contract in response to things like macro-economic trends and changing technologies while others expand. While these shifts are difficult to predict, experts from the Idaho Department of Labor reported in a February 23, 2023 interview that there has historically been an increase in computer-related jobs as a range of industries expand their automated components.

As with engineering, the employer survey offers additional evidence that the existing projections for Idaho may underestimate demand. Industry respondents estimated they would like to hire nearly 1,600 employees with computer or information science degrees within the next 12 months, potentially 15% more than already projected. Further, 76% of respondents are currently struggling to fill jobs that require a computer or information science degree. Notably, survey respondents comprised a much smaller segment of the state's overall computing employee population than on the engineering side. Consequently, the computing estimates almost certainly significantly undercount statewide demand.

Employer Survey Respondent Computing Employees in Idaho Compared to Overall Number of State Computing Employees.

	STATE TOTAL 2020	STATE TOTAL 2023 (Estimated)	SURVEYED COMPANIES (Estimated)*
Computer Occupations (15–2000)	15,821	19,588	3,856

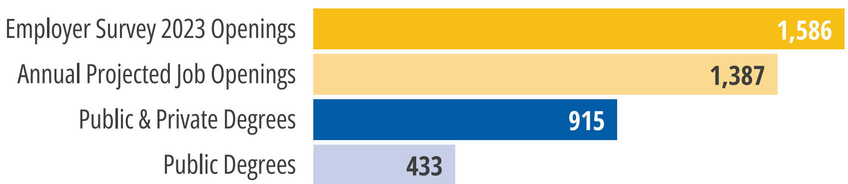
**Survey response options were presented as ranges and these totals assume a midpoint value of the selected range.*

Employer interviews also revealed how workforce shortages can have a downward impact on hiring demand. For example, in past years Idaho establishments have shifted or expanded their businesses outside the state after being unable to fill positions locally. In fact, some technology employers shared that the recent shift to remote work may enable Idaho-based companies to hire out of state to counterbalance local undersupply. Nonetheless, the strong demand for these occupations nationally also means that computer and information science graduates could remain in Idaho and work for employers located virtually anywhere while contributing to Idaho's tax base, reinforcing the benefits of steady graduate production. These types of decisions have the potential to drive demand up or down depending upon the local availability of talent.

Computer and Information Science Gap Analysis

The available quantifications of supply (represented in the blue bars below) and demand (represented by the yellow bars) indicate a gap between the number of computer and information science graduates from Idaho public institutions and the needs of Idaho's employers. Given the strong growth trends in this field, the identified gap appears robust across a range of specifications and appears likely to continue over time if present trends continue.

Idaho Institution Annual Computer and Information Science Degrees (Average of 2018–2020), ID DoL Projected Annual Computing Job Openings (2020–2030) & WICHE Employer Survey Hiring Demand Estimates (2023)



Sources: Integrated Postsecondary Education Data System, Idaho Department of Labor Occupation Projections (2020–2030), WICHE Employer Survey

Student Flow Model

The flow model described above is an important tool to help understand the challenge facing Idaho policymakers, industry leaders, and others committed to this work. The broad takeaway from adjustments to the flow model is that even with substantial improvements in postsecondary completion, few additional degrees would be produced. Improvements to college participation rates, which are obviously a broader state concern, have the potential to drive more students into these fields of interest. A key concern, though, is trying to ensure that those additional students are well-prepared to enter and succeed in the fields of interest.

The results of the flow model are stark. Even with substantial improvements in underlying metrics, like high school graduation rates and postsecondary progression, the state would produce relatively few additional degrees. This effort must be comprehensive and reach new populations of students who have not previously been interested in these fields. Additionally, the data point to the need for engaging students outside of the traditional high school-to-college pipeline.

Next Steps

As noted above, WICHE's does not aim with this report to create a detailed strategic plan for an engineering and computer and information science degree growth initiative. Instead, our intent is to provide a strong, evidence-based framework for potential next steps that is tailored to Idaho's context. The strong, overarching conclusion based on our analysis of the available data is that immediately moving to increase postsecondary capacity in these fields will not greatly increase production. It is important to recognize as a starting point that outcomes of initiatives like the one in Utah are useful guides, but have taken place in a different demographic reality than the one currently faced by Idaho.

The ultimate solution for Idaho will be to develop an Idaho-centered approach. The steps proposed below could form the framework for detailed strategic planning in the future.

Creating a Shared Vision & Coordinated Plan

Generating additional graduates in high-demand fields such as engineering and computer science is a complex, long-term endeavor. The downward demographic trends driving the overall number of high school graduates Idaho is expected to produce paired with the state's declining college-going rates mean the state is facing significant headwinds as they seek to increase supply. While Utah's initiative took place in a growth context (both demographically and economically), Idaho will face a more challenging environment for a similar effort (although the state's economic outlook is very positive). Moreover, addressing the multifaceted challenges of demographic and large-scale educational trends such as the college go-on rate will require the development of equally multifaceted responses.

To drive this effort, the state could facilitate an industry-led partnership between key stakeholders in policy and education to guide the development and ongoing refinement of a shared vision for increasing the number of engineering and computer-related graduates and a set of short- and long-term strategies to achieve this vision. This approach should also situate the effort in Idaho's broader economic context, considering the overall realities of the state's labor market and pressing shortages in other STEM fields such as healthcare.

With substantial attention already focused on college go-on rates, an engineering and computer science growth initiative should complement those efforts with a focus on supporting improvements in K–12 preparation for these fields, as well as driving interest among students.

Additionally, a potential initiative can also work to create and expand other potential student pipelines through enhanced upskilling of current employees, identification and recruitment of individuals who completed substantial credits in these fields but left postsecondary education without a degree, and other strategies focused on adult students.

Identifying Clear Roles & Responsibilities

As partners in this work, industry, policymakers, universities, community colleges, and the K–12 sector should identify how they will individually and collaboratively contribute to achieving the shared vision through the identified short- and long-term strategies. For example, higher education institutions might commit to increasing the number of female students enrolling in and completing engineering and computer and information science programs, partnering with K–12 to improve the math preparedness of high school graduates, and collaborating across the two- and four-year sectors to improve transfer pathways. Alternatively, industry partners might commit to employee upskilling initiatives, provide equipment and internship or project opportunities that meaningfully address challenges identified by educational partners, and provide timely and actionable feedback to educational partners. Given the demographic trends of Idaho's youth population, an important area of focus for all partners should be identifying how to identify, attract, and support non-traditional-aged students through to degree completion.

If there is going to be a sustained initiative, WICHE strongly believes that there will need to be a statewide entity that bears responsibility for coordinating that work. Given the interest of employers and their effectiveness in driving change, it seems appropriate that some type of industry-led body should serve in that role. It is important to note that this recommendation does not imply that such a body would have authority over the other entities noted above, but would collaborate and coordinate within appropriate roles and responsibilities of the different agencies and organizations committed to addressing these issues.

Investing for Impact

In order to make the most of any investment, the partners must identify and prioritize the greatest barriers and most effective solutions to workforce supply. Engineering and computer-related fields encompass a broad range of credentials and specialties that lead to a variety of occupations. The state may consider if a broad or a targeted approach will be most effective for meeting their goals with available funds. As part of this analysis, they should also focus on leveraging Idaho's unique assets in both industry and education for maximum value. Finally, it will be critical to balance immediate employer needs with sustainable growth plans that have the flexibility to account for changing dynamics such as recessions and shifts in automation.

Hopefully, readers of this report will agree with the conclusion that immediately investing in postsecondary capacity improvements should not be the first priority. Obviously, continuing to invest in these programs to make sure that they are turning out high-quality graduates is essential, but it does not appear that postsecondary capacity is the current limiting factor on degree production. Investment must instead first focus on growing the pipeline of students who are prepared to enter and succeed in these fields. Capacity issues can be addressed as those trends begin to change.

Data, Metrics, and Research

While it is standard fare for a report on postsecondary supply and employment demand to feature a recommendation related to data and metrics, that does not make it any less important. As part of the framework, WICHE recommends that industry leaders and other key agencies and organizations coalesce around meaningful metrics for understanding how the initiative that is envisioned is impacting outcomes. It would be easy to focus solely on the number of graduates that are produced annually in each field, and we agree that is an important metric. However, if, for example, the number of students enrolled in public postsecondary institutions in the state declines substantially, but the number of graduates in these fields holds steady, that would be a sign of some success. This report contains numerous different data points and ways of considering supply and demand issues. Certainly not all of the data points will resonate, but they could represent a starting point for consideration. As an initiative unfolds, it is highly doubtful that every approach and policy change will bear fruit, but with a successful monitoring and evaluation approach, it will be possible to continuously refine efforts to improve outcomes.

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INTRODUCTION

With a high-skill, high-tech workforce emerging as a hallmark of a flourishing economy, a steady supply of well-trained graduates in engineering, computer science, and related disciplines will play a critical role in Idaho's future. From building and maintaining the infrastructure needed for the state's fast-growing population, to providing the talent demanded by key industries, engineers, engineering technologists, and computer and information science professionals are a foundational pillar of the state's growth.

These high-paying occupations offer Idahoans family-sustaining wages and contribute to the state's tax base and overall economic vitality. Engineering, engineering technology, and computing occupations all pay well above the average annual salary in the state, with engineering technologists earning 24% more than the average occupation, engineers earning 78% more, and computing occupations a whopping 112% more than the average according to the most recent available data.[11] Moreover, many of these occupations are in high-growth fields, with environmental, industrial, civil, mechanical, electrical, computer hardware, and nuclear engineers, electrical and electronic technicians, and software developers, computer and information systems managers, computer systems analysts, and network and computer system administrators all present on the Idaho "Top Jobs" list.[12] Yet the impact of these occupations on the state goes far beyond these direct contributions.

Average Annual Wages in Idaho Occupations

All Occupations
$60,580

Engineering Occupations
$108,133

Computing Occupations
$128,391

Engineering Technologist Occupations
$74,821

Source: WICHE analysis of Idaho DoL data.

Idaho's key industries as identified by the state's Department of Commerce all rely on these professions, in particular advanced manufacturing, aerospace, food production, shared services, and energy.[13] Idaho companies of all sizes — from large employers like Micron Technology and Idaho National Laboratory (INL) to local small businesses — rely on the high-tech workforce to maintain their operations and to spur growth and innovation. According to interviews WICHE conducted with multiple employers between January and April 2023, many of the state's fastest growing companies have been founded, launched, and staffed by graduates of the state's engineering and computer science programs, bringing new industries and opportunities to the state. Therefore, a healthy pipeline of engineering and computer and information science graduates seems to play a pivotal role in the continued growth of Idaho's economy.

Yet in recent years, industry leaders have begun to express concerns that they cannot find enough talent in these critical fields, impacting their companies' growth and innovation. These leaders expressed interest in launching an engineering and computer science growth initiative similar to a long-time effort in Utah to address these gaps. A recent analysis of Utah's initiative found that the number of engineering and computer science graduates from Utah public institutions more than doubled between 2000 and 2020, as did engineering and computer science employment over the same period. The report's authors also found that in 2020, Utah's engineering and computer science workforce sustained and supported 238,419 jobs, $19.1 billion in earnings, and $25.2 billion in gross domestic product for the state.[14]

In response to these industry concerns, the Idaho State Board of Education commissioned an analysis from the Western Interstate Commission for Higher Education (WICHE) to explore the issue. Guided by an industry advisory group, the project team reviewed existing research, analyzed publicly available data, modeled the projected supply of graduates using Idaho data, and conducted a range of employer engagement activities to answer two key questions:

1. Is the supply of engineering and computer science graduates from Idaho's public institutions adequate to meet current and projected industry demand?.
2. If not, how can the state strategically address the gap between supply and demand?.

This analysis was not intended to provide a complete and detailed strategic plan, but rather to assist industry with articulating the gap between supply and demand to the greatest extent possible and identifying high-level, evidence-based approaches to increase credential production.

METHODOLOGY

Understanding Supply

Graduates in engineering, engineering technology, and computer-related fields from Idaho postsecondary institutions are used as a proxy metric for the "supply" of new workers available to the state's businesses. To analyze this population WICHE used publicly available data from the Integrated Postsecondary Educational Data System (IPEDS) as well as data from the Idaho State Board of Education (more detail on the State Board of Education data can be found in the Appendix).

After consultation with the Industry Advisory Team and a literature review, WICHE opted to include three codes from the Classifications of Instructional Programs (CIP) — developed by the National Center for Educational Statistics to offer a standardized way to categorize postsecondary academic programs by field — in the analysis.

- **CIP 11 – COMPUTER AND INFORMATION SCIENCES AND SUPPORT SERVICES** Instructional programs that focus on the computer and information sciences and prepare individuals for various occupations in information technology and computer operations fields.[15]
- **CIP 14 – ENGINEERING** Instructional programs that prepare individuals to apply mathematical and scientific principles to the solution of practical problems.[16]
- **CIP 15 – ENGINEERING TECHNOLOGIES/TECHNICIANS** Instructional programs that prepare individuals to apply basic engineering principles and technical skills in support of engineering and related projects or to prepare for engineering-related fields.[17]

A note on terminology, the term "computer science" as used in the Utah initiative refers to the full range included in CIP 11 (a wide range of computer-related degrees) thus the term computer science has been replaced with computer and information science to more accurately reflect the degree types discussed. In addition, while this report focuses on graduates of public institutions, the contributions of the state's private institutions are reflected where appropriate to provide additional information on available supply.

The analysis primarily focuses on the credential type most typical for entry-level employment in its related field, however, additional information on postsecondary degree types critical to industry such as masters and doctoral degrees are included as well. After receiving substantial feedback from employers on the topic of non-degree credentials such as certificates, it became clear that there is not consensus among Idaho employers on any type of certificate that was critical for employment in these fields, thus, they are not a primary focus of this analysis.

Of course, recent postsecondary graduates are not the only source of supply in the labor market. Employers need to hire across a range of experience levels and some Idaho businesses hire from regional, national, or international candidate pools and net-migration also affects labor supply. However, qualitative research demonstrates robust employer demand for entry-level hires in the fields of interest — typically bachelor's graduates — as well as a strong employer preference for hiring Idaho graduates.[18] Therefore, degree production in engineering and computer-related fields presents a useful, though imperfect, way to think about workforce supply.

To better understand the pipeline supplying graduates of these two fields, WICHE employed a range of quantitative and qualitative approaches. This work includes a complex student flow model developed by the National Center for Higher Education Management Systems (NCHEMS) that examines how the number of graduates in these fields may change in the future based on current trends and state demographics.

This model is based on numerous different data points from the education pipeline with a focus on the three fields of interest: engineering, engineering technologies, and computer science and information services.

At a high level, the model shows what happens to degree production when you adjust any one of a number of "levers" related to the education pipeline. This is not designed to be a tool for making perfect projections about future degree production, but more of a tool to show how changes in important metrics are likely to impact overall outcomes.

The model will help policymakers, industry leaders, and others to see where it might be possible to get the best "bang for the buck" in terms of investment.

The model is built by analyzing a combination of publicly available data from the U.S. Department of Education's Integrated Postsecondary Data System (IPEDS), U.S. Census Data, state high school graduation rates, and student-level data provided by the Idaho State Board of Education. Each of these data sources is used to build up a model of the education pipeline.

Within the model, we are able to then adjust key metrics, including

- High-school graduation rates
- College go-on rates
- Number of out-of-state students attending college in Idaho
- Overall participation rate of Idaho residents in postsecondary education (which helps account for adult students)
- Progression rates within particular degree programs

With each adjustment, the model then calculates the change in degrees produced, with a focus on the three fields of interest. As an example, Idaho institutions annually produced 737 engineering degrees on average from 2019–21. Based solely on shifts in the population and assuming the status quo in all metrics, by the 2029–30 school year, the state would produce a total of 37 additional bachelor's degrees in Engineering (this is not an increase of 37 per year, but 37 total over the time frame). As will be discussed in greater detail below, this would not fill the expected gaps, and changes in some metrics would be expected to produce greater gains than others.

One metric that the model does not adjust for is the percentage of students who elect to go into the fields of interest. As will be discussed below, this is likely an important piece to consider as well. Separate data analyses below examine the percentage of students ever choosing a field of interest, but it is difficult to say if these numbers are good, bad, or indifferent without appropriate comparisons and additional research.

It is important to emphasize again that the model is not intended to be an exact projection model, but to help guide thinking and approaches to addressing the issues raised by industry and key state employers. It is an essential tool for situating the issue within Idaho's population and demographic context.

Estimating Demand

There is no one perfect data source that cleanly lays out the precise number of new engineers and computer science graduates that Idaho will need in the future. Instead, WICHE has examined a range of measures, trends, and projections, and paired that with first-hand information from Idaho employers who are looking to hire these graduates.

Historical employment trends

The Bureau of Labor Statistics (BLS) offers historical estimates of employment by occupation at the national and the state level, allowing for cross-state comparisons. BLS also produces projections of employment by occupation, but only at the national level.

Occupational projections

The Idaho Department of Labor (ID DoL) produces state-level projections of employment by occupation, which provide the best available state-level projections of hiring demand by occupation despite certain limitations. For example, the 2020–2030 ID DoL projections do not yet reflect the projected impacts of significant federal policy changes such as the CHIPS and Science Act (CHIPS Act) and the Infrastructure Investment and Jobs Ac (IIJA).

Employer survey & interviews

The project team supplemented the existing ID DoL projections with results from a 2023 employer survey on hiring demand in fields of interest and in-depth interviews with a subset of key industry representatives.

Gap Analysis

Degree production and projected job demand in related fields are not a one-to-one match, but comparing the approximate magnitude of the difference between the two does provide some sense of the "gap" that exists between supply and demand. Meanwhile, examining projections based on current trends offers a way to understand whether identified gaps are likely to grow or to shrink if present trends continue. In the sections that follow WICHE has attempted to combine the available evidence to assess the gap in degree production but recognizing that many different factors may affect that gap for all three fields of interest.

SUPPLY OVERVIEW

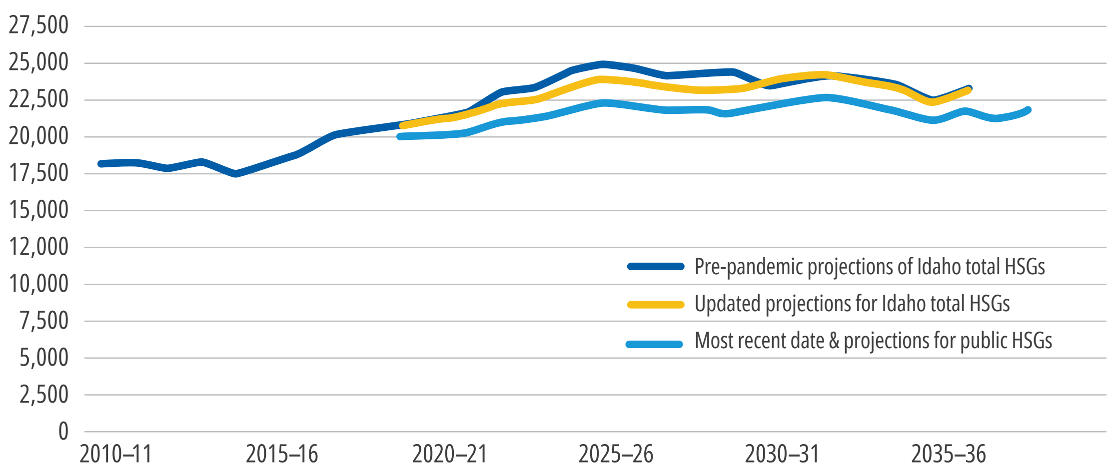
General Student Trends

Nationally, the number of students enrolled in postsecondary education is projected to grow by nine percent by 2031.[19] That growth would be welcome across the country as the last decade has seen steady declines in the number of students enrolled. Idaho has seen substantial drops in its college-going rate in recent years. The percentage of high school graduates enrolling in a postsecondary institution within three years of graduation has declined five percentage points, from 63% to 58% from the graduating class of 2015 to the class of 2019 (the most recent year for which data are available).[20] This mirrors national trends, which have also shown a declining number of high school graduates enrolling in postsecondary institutions.[21]

While these metrics relate to rates, the raw number of potential future graduates is also a key concern when considering approaches to increasing the number of future graduates in particular fields of study. A useful starting point for this piece of the puzzle is projections about the size of Idaho's future high school graduating classes.

The state's future high school graduating classes are expected to grow through the middle of the decade, followed by a period of modest decline, ending in 2037 at roughly the same number of high school graduates as the state produces today. This is shown in Figure 1.

Figure 1. Projected Idaho high school graduates



Source: WICHE, Knocking at the College Door

These trends help set the context for Idaho's intended effort to grow the number of graduates in the three fields of interest. The solid dark line represents projections made by WICHE in 2020 using data that predates the COVID-19 pandemic. The dotted lines represent updated projections with more recent state data. While the new information indicates a slightly lower peak in the total number of graduates in the middle of the decade (represented by the dark dots), the longer-term numbers are relatively consistent with previous projections. Idaho is still expected to see a relatively flat number of high school graduates through the remainder of the projected period.

While Utah is often cited as the model for an initiative such as this, it is absolutely essential to recognize that Utah's effort started in a vastly different context than what Idaho faces today. As Utah launched its work, the state was in a period of growing high school graduating classes, increasing postsecondary enrollment, and a booming state economy.[22]

While Idaho's economic growth continues to be strong, the trends in the other two areas are quite different from those Utah faced. As can be seen in Figure 1 above, Idaho is expected to soon reach a peak in the number of high school graduates it produces, followed by years of relatively constant production. Coupled with the state's college go-on trends, this necessitates different thinking and different policy approaches. While in Utah, the effort benefited from natural growth in potential student populations, meaning that the major interventions could focus on increasing postsecondary capacity, in Idaho, as the data will show, interventions likely will have to focus on growing the pipeline of potential students as a precursor to increasing postsecondary capacity to handle influxes of students in these majors.

Essentially, this initiative must develop a laser focus on being more efficient with a smaller number of students. As the analysis on the following pages hopefully makes clear, Idaho's pathway to an increased number of graduates in Engineering, Engineering Technology, and Computer and Information Science requires a concerted effort across the pipeline, from interesting more K–12 students in these fields at younger ages, to improving math preparation in K–12, to increasing the percentage of students who are likely to succeed that select one of these fields, to supporting them after they declare a major all the way through to graduation. Simply put, based on the data and analysis that follow, if the state invests resources in increasing postsecondary capacity in these fields without prior efforts to grow the pipeline of incoming students, it is unlikely that the number of graduates would meaningfully increase.

To get to that conclusion, we walk through analysis of the current pipeline, and blend that with the underlying trends described at the outset of this section.

Cohort Analysis Background

To shed further light on issues of supply, WICHE has analyzed student-level data provided by the Idaho State Board of Education and the State Department of Education to identify factors that are associated with students choosing to major in one of these fields and succeeding once they do so. This analysis also examines how many students with these characteristics of success are opting for and succeeding in different educational pathways. The aim is that this analysis can help sharpen the focus of policy and financial interventions to boost the number of graduates working in Idaho.

For this work, WICHE has examined two discrete cohorts of students — those entering public postsecondary institutions in the state for the first time in the 2013–14 school year and those doing so for the first time in the 2018–19 school year. Descriptive data for the two cohorts are useful for comparing differences over time and across majors of interest — in this case computer and information science, engineering, and engineering technologies. WICHE selected these cohorts intentionally, with the earlier cohort being chosen to provide enough time for program completion and the more recent cohort selected to provide more current information while still allowing some time to observe progress through the postsecondary system.

The data WICHE received from the Idaho State Board of Education runs through the 2021–22 school year.

Cohort Demographic information

In the following sections, descriptive demographic data are presented for the two cohorts. [23] As can be seen in Table 1, both cohorts feature more females than males, consistent with other demographic data reported by the Idaho State Board of Education.

The data show a decreasing overall cohort size of first-time enrollees in postsecondary education from the 2013–14 to 2018–19 cohorts. Additionally, both cohorts show a slightly larger population of females than males.

Similar to Idaho's overall population, the race/ethnicity of the cohorts is predominantly white, as can be seen in Table 2.

Table 1. Gender distribution of cohorts

	2013–14	2018–19
Females	53.0%	54.6%
Males	44.8%	45.1%
Unknown/Unreported	2.2%	< 1%
Total Students	**21,894**	**18,883**

Table 2. Race/ethnicity of cohorts

	2013–14	2018–19
Black/African American	1.8%	1.9%
Asian	1.6%	2.4%
NHOPI	< 1%	< 1%
AI/AN	1.1%	< 1%
White	79.8%	79.4%
Multiracial	1.6%	2.0%
Hispanic	11.4%	11.5%
Unknown/Unreported	2.5%	1.6%
Total Students*	**18,881**	**17,926**

**Note: The number of students reported in this table differ across variables due to missing data for some students.*

Standardized Exam Math Results

WICHE also received information on student results on standardized tests. Two exams were considered —– the Idaho Standards Achievement Test (ISAT) and the SAT (the meaning for the acronym of this national exam was dropped years ago but originally stood for "Scholastic Aptitude Test"). Distribution of the results is described in Tables 3 and 4 (page 26). Our focus is on students' math results and the relationship between those and student outcomes in computer and information science and engineering (which is discussed in greater detail in later sections). These results are only presented for the 2018–19 cohort and not available for all students. While multiple measures of ISAT math performance are available, WICHE focuses on the math composite results. The results include disaggregation by gender, because, as will be seen throughout this report, there is a substantial gender gap in the number of students that go into the fields of interest.

Table 3. ISAT results distribution, 2018–19 cohort

LEVEL	% OF ALL STUDENTS	% OF MALES	% OF FEMALES
1 – Does not meet standards	25.6%	26.1%	25.3%
2 – Nearly meets standards	30.0%	28.7%	30.9%
3 – Meets standards	27.2%	26.2%	27.9%
4 – Exceeds standards	17.2%	18.9%	15.9%

Students take the ISAT for math in grade 10. The four levels are described by the State Department of Education as follows: level 4 shows that the student exceeds grade level achievement standards; level 3 represents meeting grade level achievement standards; level 2 indicates that the student has nearly met the grade level achievement standards; and level 1 suggests that the student has not met those standards.[24]

Distribution on the math portion of the SAT is somewhat similar, with the majority of students grouped into the middle bands.

Table 4. SAT scores, 2018–19 cohort

LEVEL	% OF ALL STUDENTS	% OF OF MALES	% OF OF FEMALES
< 301	< 1%	< 1%	< 1%
301–400	9.0%	8.2%	9.6%
401–500	29.3%	26.6%	31.4%
501–600	41.5%	41.5)	42.0%
601–700	15.4%	18.1%	13.3%
701–800	4.4%	5.9%	3.1%

ISAT results were available for about 37% of students and SAT results were available for about 34% of the 2018–19 cohort with substantial overlap meaning most students who took any exam took both. With only about a third of students having math scores, caution is warranted before drawing firm conclusions about math results in the subsequent sections. There are statistically significant differences between the populations of students who do have results and those that don't, but the results, as will be shown later, are important and suggestive in helping to guide potential policy decisions. This is an important vein of analysis with substantial research showing strong connections between math preparation and student success in fields like engineering and computer science, although this relationship can also be tied to students' perceptions of their own self-efficacy in math.[25]

The gender differences in distribution on both tests are relatively consistent and statistically significant. More males tend to score in the highest bands, but, as will be discussed in greater detail below, this modest difference does not come close to explaining the substantial gender gap in the students who choose these three fields of interest.

Geographic

WICHE is also able to examine geographic information for a subset of students in each cohort. Using generally accepted definitions, the distribution of students in the two cohorts varies in their location, as can be seen in Table 5.

Table 5. Geographic distribution of cohorts

LOCALE	2013–14	2018–19
City	26.0%	26.4%
Suburb	29.7%	26.7%
Town	22.7%	24.3%
Rural	21.6%	22.7%
Total Students	**8,503**	**9,737**

As can be seen in the Table 5, in both cohorts, the majority of students live in cities and suburbs, with over 55% of postsecondary students coming from schools in those locales in the 2013–14 cohort and over 53% doing so in the 2018–19 cohort. With concerns about inequalities across regions of the state in math preparation, this distribution will be examined in greater detail below for considering impacts to the supply pipeline for future engineering and computer and information science graduates.

Degree Completion Results

In the two cohorts analyzed, a large number of students completed postsecondary credentials. The information in Table 6 shows the distribution of completions in all fields as well as the percentage of students who were still enrolled and the number who no longer appear in the dataset. This suggests that they may have stopped out, although this should not be taken as a detailed analysis of overall completion rates due to various data considerations.

Table 6. Degree distribution by cohort

DEGREE LEVEL	2013–14	2018–19
Associates	6.2%	5.4%
Bachelor's	22.9%	17.7%
Master's	6.4%	6.1%
Doctorate	< 1%	< 1%
Still Enrolled	< 1%	8.4%
No Longer Enrolled	63.6%	62.3%
Total Students	**21,894**	**18,883**

As would be expected, the data for 2013–14 show more credential completions and fewer students still enrolled. Of those who completed degrees or are still enrolled, more than 80% of degree completers in the 2013–14 cohort earned bachelor's or higher degrees, while just under 17% of degree completers earned associates degrees. For the 2018–19 cohort, the numbers are closer to 60% completing bachelor's or higher, with a quarter of that population still enrolled and about 14% earning associates degrees. A large percentage of both cohorts is no longer enrolled.

ENGINEERING

Engineering Supply

Historical trends in Idaho's engineering bachelor's degree production — the typical entry-level credential of most engineering professions[26] — show growth between 2010 and 2020, primarily driven by substantial growth between 2010 and 2015.

Supply modeling shows that if contributing trends persist, Idaho can expect only minimal increases in the number of engineering graduates produced annually by its public institutions. A projected levelling off of the overall number of high school graduates in the state and a negatively trending college go-on rate of Idaho high school graduates are among the primary contributors to this low growth projection.[27]

Meanwhile, existing research shows that just over 60% of engineering bachelor's degree recipients who were Idaho residents at the state's public institutions are found in the state's unemployment insurance data after graduation, suggesting that a large portion of graduates from Idaho institutions may be leaving the state.[28] Under 40% of out-of-state students are found in working in jobs covered by the state's unemployment insurance data (including international students, who are over-represented in engineering programs).[29] As a result, the total number of graduates produced by the state's public institutions may overstate the available workforce supply due to outmigration, though there are not available data for the in-migration of graduates in these fields from other states.

Importantly, data analysis for the project also revealed that women are significantly less likely to select engineering majors, although those who do so are more likely to complete their degrees.

Engineering Technology

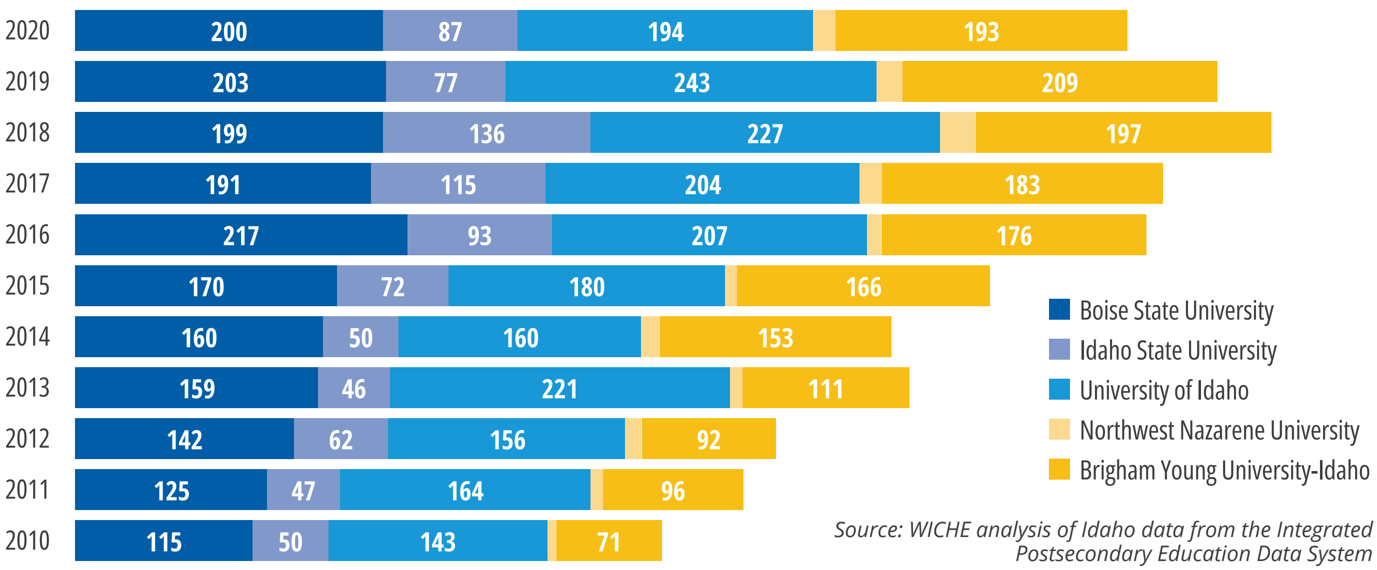
Engineering technology programs have historically been offered at the sub-baccalaureate level, including associate degree and certificate options. Between 2018 and 2020, Idaho produced 166 associate degrees in engineering technology per year; in 2020, the highest percentage came from Idaho State University (40%) followed by the College of Western Idaho (22%), the College of Southern Idaho (17%), North Idaho College (6%), and Lewis-Clark State College (4%). The remaining 10% of the annual associate degrees were from Brigham Young University-Idaho (BYU-Idaho). Currently the state's public institutions only produce a handful of graduates in bachelor's degree programs in engineering technology — 15 per year statewide between 2018 and 2020.

While BYU-Idaho does graduate a significant number of students in CIP 15, they are largely in subcategories of the designation that may more naturally fit into descriptive categories outside of engineering. For example, their main bachelor's degree offering in Engineering Technology is in CIP 15.1202 — Computer/Computer Systems Technology/Technician (from which they produced an average of 123 bachelor's degrees per year between 2018 and 2020).

Trends in Degree Production

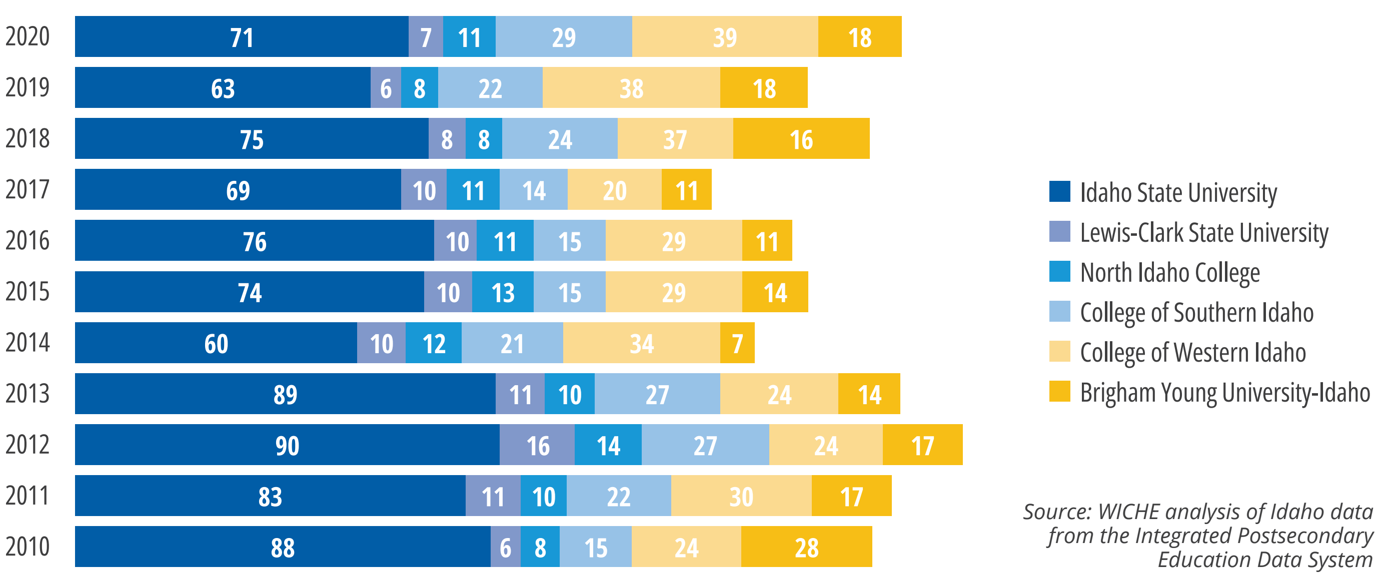
We begin the supply analysis with summary data on completions from all Idaho institutions. As can be seen in Figure 2, according to federally collected data, Idaho's institutions grew the number of Engineering graduates the latter part of the 2010s, but that growth has tapered off, which would be consistent with the observed decline in the number of students declaring one of these fields as their major. Figure 3 shows completions of associates degrees in engineering technology have been more volatile and in 2020 (the most recent available year of data), eclipsed 2010 numbers.

Figure 2. Annual bachelor's degree completions in engineering from Idaho institutions



Source: WICHE analysis of Idaho data from the Integrated Postsecondary Education Data System

Figure 3. Annual associate degree completions in engineering technology from Idaho institutions



Source: WICHE analysis of Idaho data from the Integrated Postsecondary Education Data System

The growth over time for bachelor's degrees in engineering is particularly noteworthy, but further and continuing analysis is warranted to determine how much all institutions (including BYU-Idaho) contribute graduates to the workforce and whether graduates are employed in the state. As noted earlier, previous research by the Idaho State Board of Education shows that engineering graduates in particular tend to have a lower-than-average rate of being found in state employment data.[30]

Cohort Analysis: Engineering and Engineering Technologies

Using the data from the two cohorts of students, WICHE analyzed pathways, progression, and successful student outcomes in the different majors of interest. This section presents those results, starting with descriptive data about the number and characteristics of students who opt into these majors, then similar data about those students who complete degrees in these fields.

This analysis builds toward a more complex model that estimates the association between different student characteristics, including performance on math standardized tests and student demographics, and pursuing and completing a degree in these fields. The model is not meant to provide causal conclusions, but to try to illustrate the types of students who are succeeding in these fields as a tool to assess the potential pathways for greatly expanding the number of graduates.

In this vein, this analysis is complementary to the model showing how improvements in different areas of the education pipeline are likely to impact the potential future number of graduates in different ways (please see the section below on the student flow model).

Descriptive Data – Engineering and Engineering Technologies Supply

As a first step in this analysis, Table 7 shows the percentage of students who declare a major within CIP code 14 or 15 at any point in the time frame covered by the data, as a percentage of all students that ever declared a major.

Among the 2013–14 student cohort, of all the students who declared a major, 7.5% were engineering majors at some point, which decreased to 6.0% for the 2018–19 cohort. For the engineering technologies major those numbers were 1.5% for the 2013–14 cohort and 1.3% for the 2018–19 cohort.

Table 7. Percentage of students declaring engineering and engineering technologies as a major

MAJORS	2013–14	2018–19
CIP 14 (Engineering)	7.5%	6.0%
CIP 15 (Engineering Technologies)	1.5%	1.3%
Total Students Declaring a Major	**18,929**	**16,839**

While it is not fully appropriate to draw trends from two points in time, the decline in the overall number of students declaring a major is supported by other data points and the drop in the percentage of students entering these fields is sobering. The decline in the percentage of students who ever declared engineering, when compounded with the declining overall numbers of students, represents a drop of 400 students between the 2013–14 cohort and the 2018–19 cohort. While not all of these enrollees may have graduated, it potentially illustrates the reasons for the end of the growth in degree production illustrated above.

Next, the analysis turns to examining some of the potential gaps between how likely different populations are to enter these fields. As a starting point, Tables 8 and 9 show the percentage of males and females that ever declare a major of engineering or engineering technology.

These data show what is well-known to faculty and leadership at institutions of higher education and consistent with volumes of research about gender disparities in engineering fields. This gender gap is persistent throughout the data points examined in this report and suggests that identifying ways to attract more females into the field may be an important approach. The results are statistically significant and substantively large. Discussion will return to questions around the gender gap in discussing the associations between performance on math standardized tests and success in these fields, but the gap remains persistent after taking other factors into account.

Table 8. Percentage of students declaring engineering as a major by gender

MAJORS	2013–14	2018–19
Female	2.1%	2.0%
Male	13.9%	11.0%
Total Students Declaring Major	**18,929**	**16,839**

Table 9. Percentage of students declaring engineering technologies as a major by gender

MAJORS	2013–14	2018–19
Female	< 1%	< 1%
Male	2.7%	2.6%
Total Students Declaring Major	**18,929**	**16,839**

Disparities by race and ethnicity were also raised as a potential issue in discussions with employers as well as staff from postsecondary institutions. Here, the data are less clear, partly due to limited information on race and ethnicity for some individuals. The data in the table below shows the percentages of students ever declaring engineering as a major.

Table 10. Percentage of students ever declaring engineering as a major by race/ethnicity

RACE/ETHNICITY	2013–14	2018–19
Black/African American	4.5%	4.0%
Asian	16.1%	10.7%
NHOPI	***	***
AI/AN	4.4%	4.0%
White	6.3%	5.9%
Multiracial	9.9%	6.9%
Hispanic	4.8%	4.5%

****Redacted due to small cell sizes.*

There are numerous interesting points from this examination. Overall, the data are clearly consistent with the decline in the number of students declaring engineering as a major. While there are statistically significant differences in the distribution across races, also of note are the sharp declines in the percentage of Asian and multiracial students who declared engineering as a major. Although the number of Asian students who declared any major grew by more than 130 students between the two cohorts, the number of those students who declared this major increased by only a single student.

Due to small numbers of graduates, a separate analysis of students declaring engineering technology as their major disaggregated by race/ethnicity is not included.

Research shows that students' math knowledge is highly predictive of selection of engineering (and ultimate success), with some caveats that this can be moderated by improvements in self-perception of math abilities and strong goals.[31] Table 11 shows the percentage of students scoring at each level of the ISAT who ever declared engineering as a major, while the subsequent table showing the same results by band of results on the math portion of the SAT.

As would be expected, for both exams there is a clear and consistent pattern of students with higher math scores being associated with a higher likelihood of ever declaring engineering as a major. Referring back to the previous data points on gender, it is also a worthwhile question to consider whether the gender gap in declaration of engineering as a major is partially explained by differences in performance on math exams by gender.

This data point shows that the gender gap persists even among students with equivalent math performance. It shows that of students from the 2018–19 cohort, only about seven percent of females with the highest math scores on the ISAT ever declared engineering as a major, while just under 26% of males with similar scores did. Looking at the spread for students who scored over 600 on the math portion of the SAT, just under eight percent of those females ever declared engineering as a major compared to almost 24% of males. For females, high math scores appear to have less of an association with declaration of engineering as a major.

The smaller number of students in engineering technologies precludes a detailed analysis of the relationship between math and major declaration, though the results do not suggest as strong of a relationship between performance on math standardized tests, nor are they statistically significant

Table 11. ISAT scores and declaration of engineering as a major

ISAT COMPOSITE LEVEL	% OF STUDENTS DECLARING ENGINEERING
1	1.3%
2	3.3%
3	6.1%
4	16.0%

Table 12. SAT scores and declaration of engineering as a major

SAT SCORE RANGE	% OF STUDENTS DECLARING ENGINEERING
< 301	0%
301–400	< 1%
401–500	1.9%
501–600	5.4%
601–700	12.9%
701–800	28.1%

Table 13. Percentage of students with high math scores declaring as engineers

EXAM	% OF MALES DECLARING ENGINEERING	% OF FEMALES DECLARING ENGINEERING
ISAT Level 4	25.7%	6.8%
SAT Math > 600	23.8%	7.7%

Throughout the course of the project, discussions with employers and others raised questions about the role of Idaho's geography in producing engineers. In particular, respondents wondered whether those from more rural areas may be less likely to enter into these fields. The data suggest there may be some truth to this, with statistically significant differences in the percentage of students from each location that ever declare engineering as their major. The numbers for both cohorts are presented in Table 14.

Table 14. Percentage of students from each locale ever declaring engineering as a major

COHORT YEAR	CITY	SUBURB	TOWN	RURAL
2013–14	9.2%	5.1%	5.6%	5.6%
2018–19	8.1%	6.3%	4.9%	5.8%

The location information comes from students' high school records, and does not cover the entire cohorts, but the results are suggestive of a modest difference with students from urban areas more likely than those from rural areas to declare engineering as a major. These results are statistically significant.

With smaller numbers of students opting into engineering technologies, the results differ. For the 2013–14 cohort, there are no statistically significant differences, but for the 2018–19 cohort, there are differences, with students from rural areas more likely to pursue that pathway. The results are shown in Table 15.

Table 15. Percentage of students from each locale ever declaring engineering technologies as a major

COHORT YEAR	CITY	SUBURB	TOWN	RURAL
2013–14	1.2%	0.9%	1.0%	0.8%
2018–19	.9%	.9%	1.7%	2.6%

Student Characteristics and Graduation

The data above shows how different student characteristics are associated with declaring one of the two broad engineering categories as a student major. This section focuses on the association between those same student characteristics and student success — defined as completing a degree — of those who ever declared one of these two fields as a major. Because the cell sizes shrink considerably when only using a subset of students (in this case, those that ever declared engineering or engineering technologies as a major), some of the analyses are not as fully disaggregated as above.

Overall, approximately 29% of students who ever declare any major in the two cohorts ultimately end up completing a degree. The data in the tables below show that the success rate for those who ever declare engineering is higher, and about the same for engineering technologies. As one would expect, the percentage of those completing a degree in the 2018–19 cohort is lower, which is likely mainly due to there being fewer years for those students to complete their studies.

Table 16. Degree completion rates for students that ever declared engineering as a major

COHORT YEAR	GRADUATED	GRADUATED IN ENGINEERING
2013–14	45.6%	68.3%
2018–19	27.9%	75.9%

Table 17. Degree completion rates for students that ever declared engineering technologies as a major

COHORT YEAR	GRADUATED	GRADUATED IN ENG. TECH
2013–14	36.0%	68.8%
2018–19	19.2%	78.4%

These tables show the percentage of students who declared the noted major who graduated. The third column shows the percentage of those graduates who completed their degree in the field of interest.

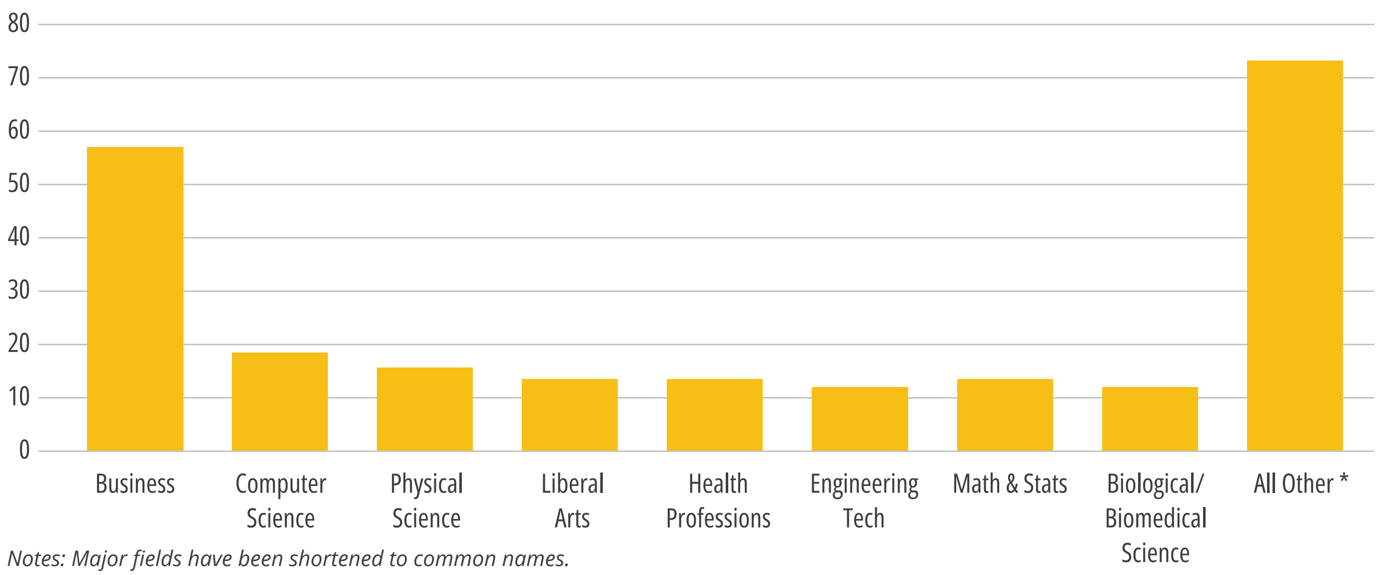
This shows that of those who graduated and at any point in their academic career declared engineering (CIP 14) as a major, in the 2013–14 cohort, about 68% graduated in engineering, while 76% of those same students from the 2018–19 cohort did so. Without broader analysis, it is difficult to determine whether this represents a material change between the cohorts or whether the shorter time horizon explains the difference. It could be that those who left the major will take longer to graduate, so over time, both the percentage of students from that cohort who graduate will increase and the number graduating in other fields will increase, driving down the percentage who graduate in engineering.

It is also difficult to know whether this number is good, bad, or indifferent without comparators from other years, and possibly other states and institutions. Even cross-state applicability and generalizability is questionable due to differing state contexts.

However, this type of pipeline metric would be essential to monitor and understand as this broader initiative continues to move forward. The interested parties should pay close attention to the pipeline and how it may change.

One key question from this analysis is what other fields these students are graduating in. Figures 4 and 5 show the most popular alternative majors for this population.

Figure 4. Majors of graduates who completed degrees in other fields after declaring as an engineering major, 2013–14 cohort



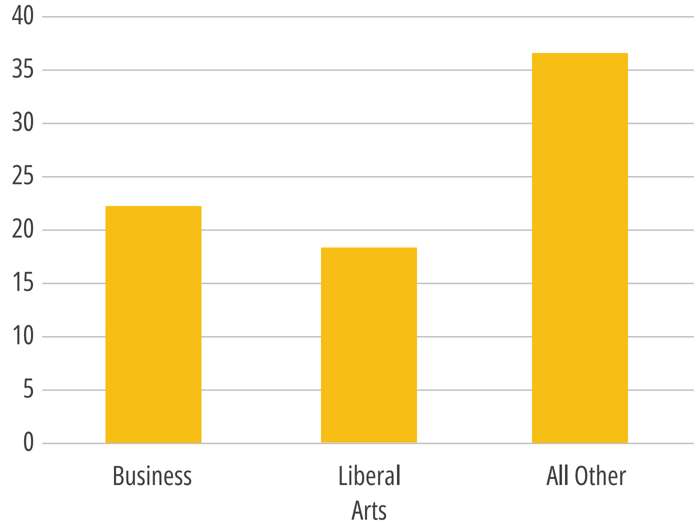
Notes: Major fields have been shortened to common names.

**The "all other" category includes numerous majors, but none with a graduate count above nine individuals.*

This shows that business was by far the most popular alternative major for those that ever declared engineering as a major. It also suggests that further analysis is warranted to help analyze why students are leaving the major and whether policy or practice decisions might lead to greater completions. Although business majors are important to the economy, converting graduates from that major to engineering may not cause as much concern as it would if most of the students who switched majors moved to education or nursing-related fields, given the state's workforce shortages in those areas.

Similar data for the 2018–19 cohort shows fewer majors, which is not surprising given that a smaller number of students from that cohort graduated in other fields. The most prevalent other fields were business and liberal arts.

Figure 5. Majors of graduates who completed degrees in other fields after declaring as an engineering major, 2018–19 cohort



Notes: Major fields have been shortened to common names.

The "all other" category includes numerous majors, but none with a graduate count above nine individuals.

Now we turn to examining whether different student characteristics are associated with differences in the rates at which students who ever declare engineering as a major graduate in engineering. Looking at differences by gender, there are very slight, but not statistically significant differences, with both females and males who ever declare engineering completing in engineering at relatively similar rates (although those women are more likely to graduate overall).

The smaller sample sizes for engineering technology do not support disaggregated analysis.

Math scores again are only available for a subset of the 2018–19 cohort, but are suggestive of a strong relationship. With small sample sizes, it is not possible to draw firm conclusions, but among those students who ever declared engineering as a major and ultimately graduated, those who, for example scored in the highest levels of the ISAT and SAT were more likely to graduate in engineering. Again, these results are only suggestive due to the limited coverage of math exam results, but are worth further consideration as this initiative continues.

Examining data by location again shows suggestive, but not statistically significant, differences with rural students who declare engineering as a major being just slightly less likely to graduate in engineering compared to peers from other locales.

Probability model

From here, we examine the student characteristics that are associated with completing a degree in engineering and engineering technology. Through a model that incorporates multiple characteristics, we are able to isolate, for example, the association between gender and completion while controlling for a student's high school location and math scores. It is important to note that this is not a causal analysis. The results discussed below do not prove that any particular student characteristic causes increased or decreased success rates but are suggestive of important relationships that should be considered as part of this initiative.

As would be expected based on the summary statistics provided above, as well as other pre-existing research, the factors associated with the biggest difference in the probability of graduating with an engineering degree are being male and scoring well on standardized tests. The model used, called a logistic regression, shows whether the likelihood of the outcome of interest — in this case, graduation with a degree in engineering — increases or decreases with a change in one variable while controlling for others.[32]

Females, even when controlling for race/ethnicity, location of high school, and math performance are about 22 times less likely to graduate with an engineering degree than males. This result is statistically significant, and, to say the least, substantively large. Again, it is worth emphasizing that this is when we also controlled for math results, so this strong relationship holds when math results are equivalent.

The math results also show strong statistical significance and pointed in the direction that would be expected. Students achieving a rating of three on the ISAT were about three times less likely to graduate in engineering than those who achieved the highest rating (again, the results were statistically significant). Students achieving a rating of two were about 10 times less likely to graduate (also statistically significant.)

The limited availability of data on math exam results greatly decreases the number of observations, making it difficult to assess in particular, the relationship between race/ethnicity and graduation in engineering while controlling for location and previous math performance.

The limited data available for math results shrank the number of observations which likely contributed to the lack of statistically significant results for location and race/ethnicity. We repeated the model without the math results, which is not ideal, because it is clearly an important factor. But the model can still show important areas for consideration.

In this second model, being female is again negatively associated with graduating in engineering. The results also show a statistically significant difference, with students who came from cities just about twice as likely to graduate in engineering as those from rural areas. Additionally, students with a multiracial background were about 2.3 times more likely than white students to graduate in engineering, while Hispanic students were about half as likely as white students to do so. All of these results were statistically significant.

In summary, these results confirm what is already suspected. It is clear that there is a strong negative association between being female and completing a degree in engineering, even when controlling for math performance. Additionally, it appears possible that there are important differences worth considering related to race/ethnicity. As Idaho's employers and higher education institutions begin considering how best to boost the number of engineers, addressing gender gaps appears to be a high priority.

Also, it is clear from these results, as well as the knowledge and expertise of institutional faculty and staff, that math skills are particularly important.

Student Flow Model

The final component of the supply analysis is a model that allows us to examine how many degrees the state is expected to produce in the coming years based on current and recent trends around college go-on rates, progression in postsecondary education, and other factors. This is particularly helpful for identifying where significant changes to the pipeline of students will have the greatest impact on the number of graduates over time. This model should not be viewed as a "crystal ball" that perfectly predicts what will happen in the future based on different inputs (like increased high school graduation rates). Instead, it should be viewed as a tool that gives industry experts, policymakers, and other interested parties a sense of which metrics and data points are particularly important if the state aims to substantially increase degree production in these fields.

Current Trends Continue

If current trends in high school graduation rates, college-going rates (both of directly out of high school for in-state and out-of-state students as well as first-time college participation of 20–44-year-olds), progression year-over-year in postsecondary, and credential completion continue through 2029–2030 the state can expect their degree production in fields of interest to hold nearly flat with an increase of less than one percent in both engineering and engineering technology.

Table 18. Current and projected additional undergraduate engineering awards by credential type

	CURRENT UNDERGRADUATE AWARDS (2019–21 PEDS AVG.)		PROJECTED ADDITIONAL AWARDS (2021–22 THROUGH 2029–2030)	
	ENGINEERING	ENGINEERING TECH	ENGINEERING	ENGINEERING TECH
Certificates	21	137	1	1
Associates	29	166	0	2
Bachelor's	737	202	37	2

The data allows for this projection to be broken down by institutional sector as well — with the "Public Research" category encompassing Boise State University, Idaho State University, and the University of Idaho.

Table 19. Current and projected additional undergraduate engineering awards by institutional sector

	CURRENT UNDERGRADUATE AWARDS BY PROGRAM (2019–21 PEDS AVG.)		PROJECTED ADDITIONAL AWARDS BY PROGRAM (2021–2022 THROUGH 2029–2030)	
	ENGINEERING	ENGINEERING TECH	ENGINEERING	ENGINEERING TECH
Public Research	543	115	36	1
Public Masters and Bachelors	4	11	0	2
Public Two-Year & Less Than Two-Year	25	175	0	2
Private	215	204	1	2

Increasing the High School Graduation Rate

Beginning with the model's first lever, high school graduation rates, we can explore the impact of an increase to the state's overall high school graduation rate on credential production in our fields of interest. If Idaho were to increase their overall high school graduation rate from its current 80% to just under 91% — an average of the highest state high school graduation rates in the country — the model projects modest degree gains over time at about seven additional bachelor's degrees in engineering per year and less than one additional associates degree per year in engineering technology. This is not surprising, given the relatively strong current high school graduation rate, there is simply limited room to grow.

Table 20. Projected additional undergraduate engineering awards with an increase in high school graduation rate

	PROJECTED ADDITIONAL AWARDS BY PROGRAM – CURRENT TRENDS (2021–22 THROUGH 2029–2030)		PROJECTED ADDITIONAL AWARDS BY PROGRAM – WITH HS GRAD RATE AT AVERAGE OF BEST-PERFORMING STATES (2021–22 THROUGH 2029–2030)	
	ENGINEERING	ENGINEERING TECH	ENGINEERING	ENGINEERING TECH
Certificates	1	1	2	2
Associate	0	2	0	2
Bachelor's	37	2	52	3

Increasing the College-going Rate

One of the most critical areas to examine is how changes to Idaho's college-going trends might impact future degree production. Between 2017 and 2020, the state saw a declining "go-on" rate, the percentage of graduating Idaho high school seniors who enroll directly in college the following fall, decreasing by over 10 percentage points during this period.[33] As the table below demonstrates, increasing college go-on rates for students directly out of high school has a more dramatic impact on degree production. If Idaho were to achieve a go-on rate of 47%, which is the national average as well as a rate the state exceeded as recently as 2018, the model suggests that could lead to 80 additional bachelor's degrees in engineering over the course of the projections. This would more than double the 37 additional bachelor's degrees expected with the current go-on rate. If the state were to approach a more aspirational goal — such as the nearly 58% seen in state's with the highest go-on rates — that number more than triples, with 118 additional degrees projected.

Table 21. Projected additional undergraduate Engineering awards due to increased go-on rates

	PROJECTED ADDITIONAL AWARDS BY PROGRAM – CURRENT TRENDS (2021–22 THROUGH 2029–2030)		PROJECTED ADDITIONAL AWARDS GO-ON RATES AT NATIONAL AVG. (2021–22 THROUGH 2029–2030)		PROJECTED ADDITIONAL AWARDS GO-ON RATES AT TOP-PERFORMING AVG. (2021–22 THROUGH 2029–2030)	
	ENG.	ENG. TECH	ENG.	ENG. TECH	ENG.	ENG. TECH
Certificates	1	1	3	3	4	5
Associate	0	2	1	4	1	6
Bachelor's	37	2	80	5	118	8

While different methods of calculating the go-on rate can offer different perspectives — for example using a three year after-high school timeframe to better capture students who take time off for a gap year or a Church mission — it is clear that increases in the go-on rate are an important piece of the puzzle.

Increasing Out-of-State Students

Findings from the State Board of Education have also revealed some substantial increases in out-of-state students opting to attend college in Idaho in recent years — including a 21% jump in enrollment at Idaho universities from fall 2019 to 2022.[34] While there is speculation this was driven by pandemic-related trends, if out-of-state enrollment continued to grow at a rapid pace, we can see this also leads to a small uptick in engineering degree production.

Table 22. Projected additional engineering undergraduate awards with increased out-of-state directly out of high school (DOHS) college-going numbers

	PROJECTED ADDITIONAL AWARDS CURRENT TRENDS (2021–22 THROUGH 2029–2030)		PROJECTED ADDITIONAL AWARDS – OUT OF STATE DOHS COLLEGE-GOING INCREASED 10% (2021–22 THROUGH 2029–2030)		PROJECTED ADDITIONAL AWARDS – OUT OF STATE DOHS COLLEGE-GOING INCREASED 20% (2021–22 THROUGH 2029–2030)	
	ENG.	ENG. TECH	ENG.	ENG. TECH	ENG.	ENG. TECH
Certificates	1	1	2	2	2	2
Associate	0	2	0	2	0	2
Bachelor's	37	2	44	4	51	6

Increasing College Participation of 20–44-year-olds

Another way to explore this question is to look at the first-time college participation rate of the state's 20–44-year-old population. Currently, Idaho's participation rate for this population is 1.55%, however, the national average is just over 2% and the best-performing states sit above 3%. Attracting more adult students into the educational pipeline leads to even larger projected increases in degree production — at the top end of the range leading to nearly 30 additional bachelor's degrees in engineering per year over the projections period, more than a six-fold increase over current trends.

Table 23. Projected additional undergraduate engineering awards with an increase in first-time (FT) college participation rates of 20–44 year-olds

	PROJECTED ADDITIONAL AWARDS – CURRENT TRENDS (2021–22 THROUGH 2029–2030)		PROJECTED ADDITIONAL AWARDS – FT PARTICIPATION RATE AT NATIONAL AVG. (2021–22 THROUGH 2029–2030)		PROJECTED ADDITIONAL AWARDS – FT PARTICIPATION RATE AT BEST-PERFORMING AVG. (2021–22 THROUGH 2029–2030)	
	ENG.	ENG. TECH	ENG.	ENG. TECH	ENG.	ENG. TECH
Certificates	1	1	4	4	9	9
Associate	0	2	1	4	1	9
Bachelor's	37	2	93	3	229	6

Improving Postsecondary Progression Rates

Another scenario the model can explore is what a change in progression rates from year-to-year in our fields of interest might look like. For example, a 10-percentage point increase in progression rates (first-to-second year, second-to-third year, and third-to-fourth year) in engineering programs would generate more than three times the number of degrees with no change (about 12 new bachelor's degrees in engineering per year between 2021 and 2029). A 10-percentage point increase in progression rates is a dramatic improvement — research shows one intensive program increased retention rates in STEM fields between nine to 15 percentage points — necessitating a significant investment from the institution and including robust student support services.[35] A 10-percentage point increase in engineering and engineering technology progression rates across all institutions and each year-to-year transition would be an aspirational goal.

Table 24. Projected additional engineering undergraduate awards with an increase in year-to-year progression rates

	PROJECTED ADDITIONAL AWARDS BY PROGRAM – CURRENT TRENDS (2021–22 THROUGH 2029–2030)		PROJECTED ADDITIONAL AWARDS BY PROGRAM – 10-PERCENTAGE-POINT INCREASE IN PROGRESSION RATES (2021–22 THROUGH 2029–2030)	
	ENGINEERING	ENGINEERING TECH	ENGINEERING	ENGINEERING TECH
Certificates	1	1	5	8
Associate	0	2	1	8
Bachelor's	37	2	128	2

Student Flow Model Conclusions

Of course, no model can perfectly capture all the needed inputs nor perfectly predict outcomes. Rather, their true value lies in exploring the patterns and trends that could emerge in different scenarios by making adjustments to the inputs based on estimates of possible — if aspirational — future directions drawn from existing data and research findings.

The model levers possible with the available data show us that impacting college participation will be a key factor in increasing degree production for engineering at the bachelor's level, while important questions such as breakdowns by gender and major choice remain unanswered.

Engineering Demand

Key Findings

Taken together, historical trends that show growth in engineering employment over the last decade, projections that predict continued occupational growth, and recent qualitative data that suggest hiring demand for engineers is already exceeding these growth projections demonstrate a robust labor market for graduates with degrees in engineering fields.

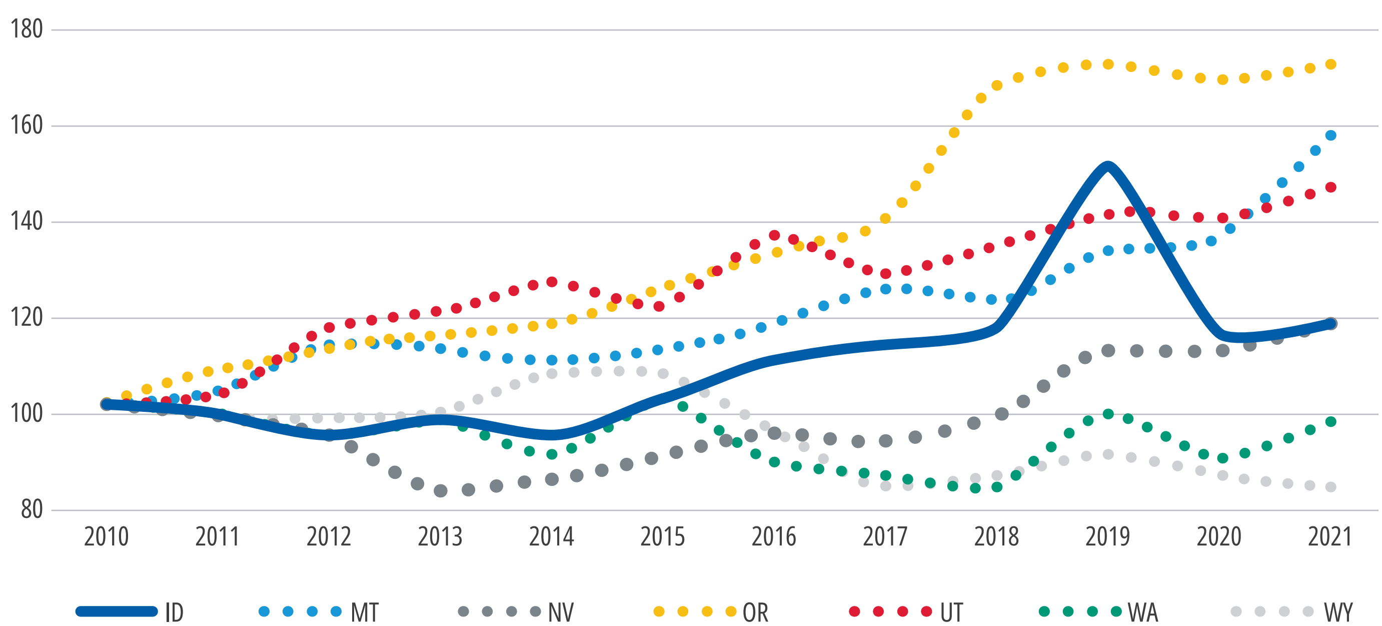
A key question for additional study will be the relationship between engineering and engineering technology fields in terms of employer demand and higher education degree production.

Historical Data

From 2010 to 2021, employment in engineering occupations in Idaho grew at a comparatively moderate pace, with BLS estimating 7,450 Idaho engineers in 2010 and that number rising to 8,710 by 2021. Among Idaho's surrounding states, Oregon saw the most dramatic growth in engineering employment during this time period, followed by Utah and Montana, while Nevada more closely matched Idaho's own growth trajectory.

However, there are some important differences in the overall number of engineers estimated to be working in each state. In the northwest, Washington employs significantly more engineers than any of Idaho's other neighbors, followed by Oregon and Utah.[36]

Figure 6. Engineering occupational employment growth overtime in Idaho and surrounding states

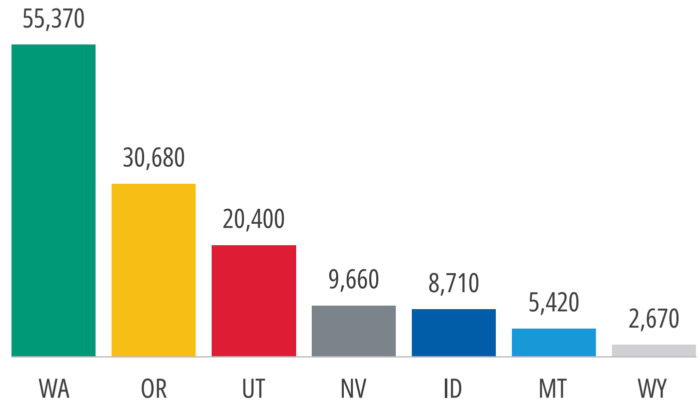


Note: *Data are indexed where 100 = Number of Jobs in 2010*

Source: Bureau of Labor Statistics, Occupational Employment Statistics (OES) Survey

The combination of ongoing regional growth and large engineering labor markets in neighboring states suggests that Idaho's engineering graduates likely have — and will continue to have — competing employment opportunities in surrounding states. This is further confirmed by a 2017 study on the inter-state movement of licensed professional engineers educated in Idaho, which showed that while a preponderance remain in the state, the most common alternative destination for engineering graduates was Washington.[37]

Figure 7. Engineering occupational employment in Idaho and surrounding states (2021)



Source: Bureau of Labor Statistics, Occupational Employment Statistics (OES) Survey

Projections

Looking forward, there is moderate growth projected for engineering as an occupational field nationally, with an increase of about 5% between 2021 and 2031. Meanwhile in Idaho, the state Department of Labor projects more dramatic growth, with the occupation growing 17% between 2020 and 2030. The Idaho Department of Labor projects that there will be 984 annual job openings in engineering due to turnover and growth each year between now and 2030.[38]

However, due to the timing of the state-level projections, the impacts of relevant policy developments such as the federal Infrastructure Investment and Jobs Act (IIJA) and CHIPS and Science Act are not yet reflected. One engineering industry group estimates that infrastructure projects funded by the IIJA alone will increase the need for engineers nationally by 82,000 and notes that these increases will affect every state given the distribution of funding.[39] Meanwhile, the CHIPS and Science Act has spurred growth in Idaho's semiconductor industry, most notably Micron's planned expansion, including the construction of a new manufacturing fab in Boise projected to create 2,000 jobs — including a subset in engineering technology fields.[40]

Therefore, it is likely that the 2020 projections underestimate the total number of new jobs in engineering that will be available in Idaho in the coming years.

> ***"If we can't hire them here than we will grow in other areas. We will go where the graduates are. We have [multiple] other offices [across the country]."***
>
> – Idaho Engineering Employer

Another crucial point is that the projected annual job openings only describe what employers are projected to need — they do not say anything about the availability of workforce to fill these openings.[41] Employer interviews revealed that workforce shortages in the short term have already contributed to suppressed workforce demand. One engineering firm described turning down projects and ultimately growth opportunities for their firm because of a lack of qualified engineers available to do the work. They also noted that this can then lead to overwork and burnout for existing employees — further exacerbating supply issues. Another Idaho employer, with offices across the country, shared that they would like to hire locally, but would hire outside the state if they couldn't find the candidates they needed.

While it is not possible to directly quantify these impacts, these comments suggest that an increase in the supply of engineers could potentially enable business growth and expand hiring demand beyond current projections, alternatively, a continued undersupply could have a dampening effect on demand.

> ***"If we were able to fill all our positions, we'd be able to get more revenue in and more clients and we'd then have demand for more engineers… we've been stifled by an inability to find people to do the work, we have more work than we have people to do."***
>
> – Idaho Engineering Employer

Engineering Technology

The linkage between engineering technology educational programs and occupations is not as direct as the link between many engineering degrees and occupations. For example, you'd likely hire someone with a bachelor's degree in civil engineering to fill a civil engineer role. However, our qualitative analysis suggested that employers in Idaho often approach technician roles with more flexibility, hiring from a variety of STEM-related degree fields and providing on-the-job training for needed skillsets. While the employer survey discussed below revealed robust demand for bachelor's degrees in engineering technology fields, as noted in the supply section, the state does not currently produce a large number of bachelor's in engineering technology fields.

Employer Survey

The employer survey conducted for this project provides further evidence that the 2020–2030 state projections may underestimate demand. While the employer survey sample was not representative of Idaho as a state, Table 25 illustrates respondents' self-reported number of Idaho-based engineering employees compared to state estimates of total employment within engineering occupations to provide some sense of the coverage offered by the survey.

Table 25. Employer survey respondent engineering employees in Idaho vs. total of state engineering employees

	STATE TOTAL 2020	STATE TOTAL 2023 (ESTIMATED)	SURVEYED COMPANIES (ESTIMATED)*
Engineering Occupations (17–2000)	10,321	10,892	6,478

**Survey response options were presented as ranges and these totals assume a midpoint value of the selected range.*

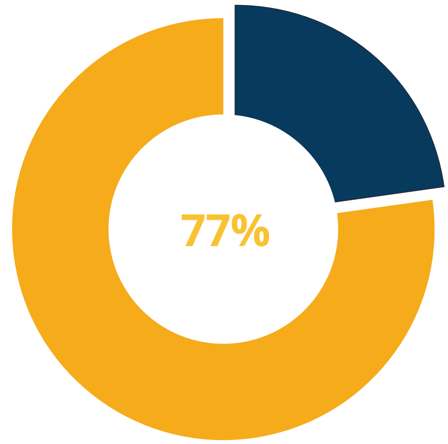
Among employers looking to hire workers in engineering roles, approximately two-thirds were looking for applicants with a bachelor's degree in an engineering or engineering technology field. However, it is important to note a subset of employers had a significant need for more advanced degree types, with nearly 20% of respondents looking for applicants with a masters' degree in engineering, and three percent seeking to hire candidates with doctoral degrees.

Respondents estimated that they are trying to hire nearly 2,000 employees with degrees in engineering and engineering technology fields within the next 12 months alone, almost double the DoL projected average annual openings. This number grows to 4,377 over the next five years, and up to 5,325 over the next 10 (even though some employers were not able to speculate beyond the five-year time horizon).

Nearly 80% of respondents indicated that they are struggling to fill jobs requiring engineering degrees.

Another key theme from the survey — as well as employer interviews — was the quality of Idaho graduates. The survey results demonstrated a strong employer preference for hiring from Idaho institutions, with 92% of responding companies agreeing that "'Hiring graduates from Idaho colleges and universities is important to us." and nearly 80% responding that Idaho universities are not producing enough graduates for their hiring needs.

Figure 8. Percent of survey respondents currently struggling to fill jobs that require a postsecondary engineering degree



Engineering Gap Analysis

The available quantifications of supply and demand indicate a gap between the number of engineering and engineering technology graduates from Idaho public institutions and the needs of Idaho's employers. The magnitude of the gap differs depending on the exact specifications used.

Considerations:

- **Type of Degree**: There is demand for a range of degree types — from associates to doctoral degrees — among Idaho's employers, although the majority of the demand appears to be at the bachelor's level. More detailed analyses exploring employers' demand for specific degree types could be a potential next step. Moreover, in engineering different specializations prepare graduates for different occupations with limited substitutability. The state may wish to focus on particular areas of importance to the state and its industries. For this initial analysis, all engineering degree types have been aggregated into a broad "engineering" category.
- **Institutional Sector**: The focus of this work is public institutions and their degree production, however, private institutions — in particular BYU-Idaho — also play a key role in producing graduates. Considering how to include the impact of private institutions (and what percentage of their graduates remain in Idaho) is another question for future study.

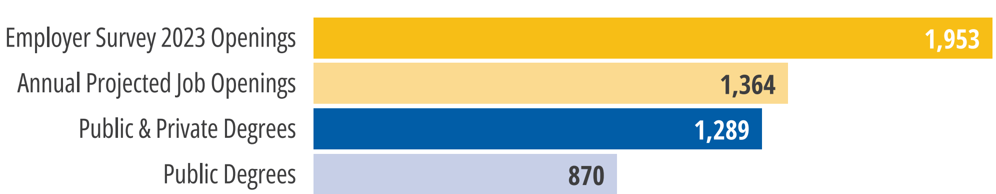
> ***"Idaho has had a fantastic record of producing graduates that can work shoulder to shoulder with engineering graduates from anywhere in the country — Purdue, Yale, Kansas State, Penn State, all the best engineering schools — we produce really, really good engineers which is unusual for a small, rural state"***
>
> – Idaho Engineering Employer

- **Migration**: Past research demonstrates that Idaho will lose some percentage of recent engineering graduates to jobs in other states. Therefore, not all of the graduate "supply" will end up in the state's labor market. Nonetheless, qualitative work did reveal that some engineers educated in Idaho opted to come back as mid-career professionals. Though these numbers cannot be quantified with available data sources, it is important to keep these in- and out-flows in mind when considering approaches to increasing supply. With previous research showing engineering graduates are among the most likely to leave the state, industry should focus on retaining a greater percentage of recent graduates in the state.
- **Time Horizon**: Projections by nature become less reliable the farther they stretch from baseline data. As a result, short-term projections have the greatest likelihood of accuracy. For this reason, numerical gaps are only presented for a 12-month period. The available data suggest that the gap between supply and demand will widen over time as Idaho (without intervention) produces only a very modest additional number of engineering graduates year- over-year and employer hiring demand rises to 4,377 job openings for candidates with a degree in engineering/engineering technology by 2028 (as indicated in the employer survey). Yet the demand-suppressing effects of workforce shortages that can lead employers to limit growth or relocate as described in interviews might ultimately drive down the overall amount of hiring demand. It's important to note that while the "gap" between supply and demand would lessen in this scenario, Idaho's economy would still be losing out on potential growth.

Summary

The available numbers (see the figure below) and the robust employer demand expressed in survey responses and interviews suggest that Idaho's labor market would benefit from a significant increase in the number of engineering and engineering technology graduates. However, supply modeling shows that the pipeline of students prepared to enter and succeed in Idaho's programs is not large enough to drive the increases Idaho employers are looking for. Taken together, these results suggest an investment in Idaho's student pipeline is needed.

Figure 9. Idaho degree production for engineering and engineering tech compared to projected job openings and employer survey job demand



Sources: Integrated Postsecondary Education Data System, Idaho Department of Labor Occupation Projections (2020–2030), WICHE Employer Survey

COMPUTER & INFORMATION SCIENCE

Computer & Information Science Supply

The National Center for Education Statistics (NCES) classifies computing degrees as "Computer and Information Science and Support Services: Instructional programs that focus on the computer and information sciences and prepare individuals for various occupations in information technology and computer operations fields."[42] Similar to engineering, historical trends in computer-related degree production at the bachelor's level in Idaho — also the typical entry-level credential for many in-demand computer-related professions[43] — show growth between 2010 and 2020. Supply modeling shows that if contributing trends persist, Idaho can expect only minimal increases in the number of computer-related graduates produced annually by its public institutions.

Research shows that a relatively high percentage of computer-related public institution graduates stay in Idaho, with over 70% of in-state bachelor's graduates employed in the state after graduation and over 50% of out-of-state graduates.[44] At the associates level, an impressive 78% of non-resident students end up in Idaho's workforce after graduation, a percentage point higher than the 77% of resident students who are found in the state's workforce.[45]

Cohort Analysis – Computer Science

This analysis follows a similar path as the previous one for engineering and engineering technologies. Using student-level data from the two cohorts (2013–14 and 2018–19 first-time postsecondary students) we present descriptive data about the number and characteristics of students who enter this major and go on to complete a degree in the field. For convenience, the full name of the field is shortened to "computer science" throughout this section.

We also conclude this section with a more advanced model that controls for student characteristics to examine relationships that may be useful in charting a path forward for this initiative.

Alternative Credentials & Skills-Based Hiring

Employers throughout the technology sector expressed a strong preference for skills over specific degree types. Many noted that they consider a candidate's portfolio of work ahead of their academic credentials.

While this might suggest employers are flocking to hire graduates of bootcamps or other short-term credential offerings, qualitative work suggested that this is not the case in Idaho.

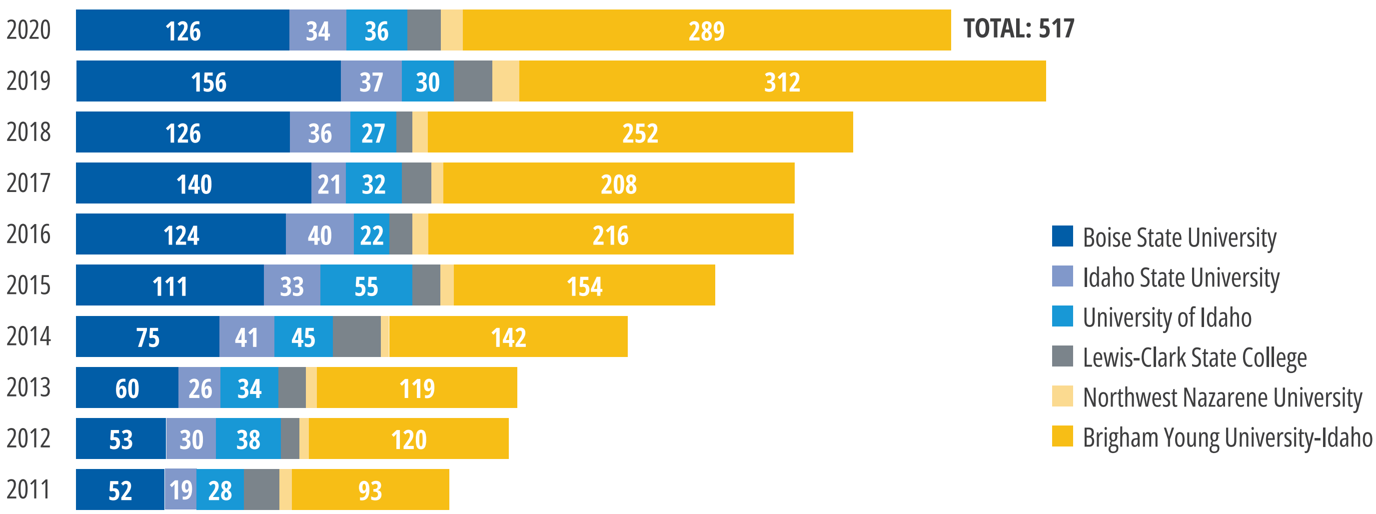
Overwhelmingly, survey respondents and interviewees in the tech sector noted that their most successful candidates came from either traditional academic pathways (such as a bachelor's degree in computer science) or from backgrounds with robust on the job training — such as cybersecurity experience gained in the military. Several employers shared that candidates from shorter-term training providers like bootcamps did not bring the desired skill level.

Therefore, despite the focus on skills-based hiring in the tech sector, degrees in computer and information science do seem to continue to offer a reasonable proxy of supply (so long as they continue to offer high-level skills training and relevant curricula).

Summary Statistics

As a first step in this analysis, we show the state trends in degree production for Computer Science. Similar to the analysis above, WICHE also examined the number of degrees produced over the past 10 years at Idaho institutions. Those results are presented in the below.

Figure 10. Annual degree completions in computer science



Source: WICHE analysis of Idaho data from Integrated Postsecondary Education Data System

At first glance, the numbers show impressive growth, nearly tripling from 2010 to 2019. However, much of that growth comes from private institutions (particularly BYU-Idaho). While that could be an important source of degree production, it is not clear what percentage of those graduates are located in Idaho and how many may be located in other states completing degrees via distance education.

There was substantial growth in the public sector from 2010 through 2015, but at that point, the growth for public institutions essentially levels off. While the private sector could be an important sector to consider, it is generally beyond the scope of this report.

Next, we begin to use the student-level data from Idaho public institutions to better understand the pipeline for computer science. The first step in this analysis shows the percentage of students who declare computer science as a major.

For the 2013–14 cohort, of all the students who ever reached the point of declaring a major, four percent declared Computer Science (CIP 11) at some point in their academic career. This grew to nearly five percent in the 2018–19 cohort, representing an increase of 40 total students (due in part to the shrinking overall size of the 2018–19 cohort compared to 2013–14.)

Table 26. Students declaring computer science as a major

COHORT	STUDENTS DECLARING ANY MAJOR	PERCENT EVER DECLARING COMPUTER SCIENCE
2013–14	18,929	4.0%
2018–19	16,839	4.8%

Next, the analysis examines the relationships between different student characteristics and declaring Computer Science as a major, with results reported in Table 27.

Table 27. Percentage of students declaring computer science as a major by gender

GENDER	2013–14	2018–19
Female	1.1%	1.6%
Male	7.4%	8.6%

Similar to Engineering, there is evidence of a large gender gap in the percentage of students who ever declare Computer Science as a major, perhaps pointing towards similar potential policy and practice interventions. These differences are statistically significant.

As noted earlier, there is a very modest, but statistically significant difference in performance on math standardized exams by gender. But similar to the analysis above, that difference is nowhere near large enough to account for the gender disparities in declaring for Computer Science. Table 28 shows the same data point — percentage of students declaring Computer Science as a major — limited to those students who achieved high levels on those exams.

Table 28. Percentage of high-scoring students declaring computer science as a major by gender

EXAM & SCORE	MALE STUDENTS DECLARING CIP 11	FEMALE STUDENTS DECLARING CIP 11
ISAT Composite Highest Level	15.4%	2.6%
SAT Math Above 600	15.2%	3.6%

This analysis shows a similar story as engineering, with students achieving high results on standardized math tests showing a greater likelihood of ever declaring Computer Science as a major. Females with high math scores still show a substantially lower likelihood of ever declaring this major compared to Males. These differences are statistically significant.

Turning to Race/Ethnicity, we examine the same information for the percentage of students of different backgrounds who ever declared Computer Science as a major.

Table 29. Percentage of students declaring computer science as a major by race/ethnicity

RACE/ETHNICITY	2013–14 COHORT % DECLARING CIP 11	2018–19 COHORT % DECLARING CIP 11
Black/African American	4.5%	3.6%
Asian	5.6%	10.7%
NHOPI	***	***
AI/AN	3.3%	6.7%
White	4.0%	4.6%
Multiracial	5.5%	4.2%
Hispanic	4.1%	4.0%
Unknown	5.2%	3.7%

****Redacted due to small cell sizes.*

The interesting points from this examination are the relatively homogenous distribution among the 2013–14 cohort, with substantial increases in the percentage of Asian and American Indian/ Alaska Native students declaring this major in 2018–19. The increases in students from these racial backgrounds accounts for the majority of the growth in total numbers between the two cohorts. The differences among groups in the 2013–14 cohort are not statistically significant, but that changes for the 2018–19 cohort.

Following the same approach as with engineering, we now examine any differences by a student's location while in high school to assess whether there are important differences to consider for Idaho's rural communities.

Table 30. Percentage of students declaring computer science as a major by high school location

COHORT	CITY	SUBURB	TOWN	RURAL
2013–14	4.5%	4.0%	3.6%	4.4%
2018–19	6.4%	5.3%	4.8%	5.3%

Again, there are noteworthy differences between the 2013–14 and 2018–19 cohorts. The distribution from the earlier cohort is not statistically significant, but it is for the latter group of students. The primary difference is the sharp increase in the percentage of students from high schools located in cities who declare this major.

With that as an overview of the relationships between students' characteristics and likelihood of declaring computer science as a major, we now turn to likelihood of completing a degree in the field. As noted earlier, overall about 29% of those students who declare any major end up completing a degree. Table 31 shows how many students who ever declared computer science as a major ended up graduating. Then of those graduates, it shows the percentage who graduated in computer science.

Although the total numbers differ, generally speaking it appears that those who at one point declare Computer Science as a major and graduate in something else tend towards Business and Liberal Arts degrees, similar to those majoring in engineering.

Table 31. Percentage of computer science majors that graduate and that do so in the field

COHORT	GRADUATED IN ANY MAJOR	GRADUATED IN COMPUTER SCIENCE
2013–14	33.4%	68.9%
2018–19	23.0%	67.3%

Turning to the question of whether different student characteristics are associated with persistence in computer science, for the 2013–14 cohort, there is a marginally statistically significant difference, with about 58% of females who ever declare it as a major completing in the field, compared to about 71% for males. For the 2018–19 cohort, there is no statistically significant difference, with about 63% of females who declare computer science as a major completing within the field, compared to 69% for males.

Looking at the relationship between math scores and persistence to completion within the major, there is not a strong relationship, mainly due to the small sample size. Similarly, the results for the relationship between location of a student's high school and persistence within the field is mixed and not statistically significant.

Probability Model

WICHE analyzed a probability model that looks at the association between graduating with a degree in computer science and various student characteristics, including gender, race/ethnicity, and location. We also, similar to the engineering analysis, use one model with math results and one without due to the limited data available. This approach allows us to control for these characteristics to try to isolate the important relationships with the hope of guiding policy and practice as Idaho considers a broader initiative.[46]

The results are similar to those for engineering. Being female, when controlling for location, race/ethnicity, and math scores, is associated with a ten-fold decrease in the likelihood of completing a computer science degree. Math results (ISAT composite achievement ranking) are less linear, but individuals scoring below a "four" associated with substantially lower odds of completing a degree in this field as well. Asian students are associated with substantially greater odds of completing a Computer Science degree (more than 10 times) than white students while controlling for the other factors. The relationships with other races/ethnicities is not statistically significant.

In the second model, when we drop the controls for math results (which again warrants substantial caution in interpreting the results), the statistically significant relationships do not change.

Student Flow Model

As in engineering, the final component of the supply analysis for computer and information science is projecting the number of degrees the state can expect to produce in the coming years.

Current Trends Continues

If current trends in high school graduation rates, college-going rates (both of directly out of high school for in-state and out-of-state students as well as first-time college participation of 20–44-year-olds), progression year-over-year in postsecondary, and credential completion continue through 2029–2030 the state can expect their degree production in the field of interest to hold nearly flat with an increase of less than 1% in computer and information science.

Table 32. Current and projected additional undergraduate computer & information science awards

	CURRENT UNDERGRADUATE AWARDS (2019–21 IPEDS AVG.)	PROJECTED ADDITIONAL AWARDS (2021–22 THROUGH 2029–2030)
	COMPUTER SCIENCE	COMPUTER SCIENCE
Certificates	146	4
Associates	234	7
Bachelor's	518	11

The data allows for this projection to be broken down by institutional sector as well — with the "Public Research" category encompassing Boise State University, Idaho State University, and the University of Idaho.

Table 33. Current and projected additional undergraduate computer & information science awards by institutional sector

	CURRENT UNDERGRADUATE AWARDS BY PROGRAM (2019–21 IPEDS AVG.)	PROJECTED ADDITIONAL AWARDS BY PROGRAM (2021–2022 THROUGH 2029–2030)
	COMPUTER & INFORMATION SCIENCE	COMPUTER & INFORMATION SCIENCE
Public Research	224	6
Public Masters and Bachelors	35	2
Public Two-Year & Less Than Two-Year	281	9
Private	360	5

Increasing the High School Graduation Rate

Beginning with the model's first lever, high school graduation rates, we can explore the impact of an increase to the state's overall high school graduation rate on credential production in computer and information science. If Idaho were to increase their overall high school graduation rate to that of an average of the highest state high school graduation rates in the country, the model projects only a handful of gains,. The model projects only 18 additional bachelor's degrees by 2029–2030 with an improved high school graduation rate, or said differently, less than one more degree per year than current trends produce.

Table 34. Projected additional undergraduate computer and information science awards with an increase in high school graduation rate

	PROJECTED ADDITIONAL AWARDS BY PROGRAM – CURRENT TRENDS (2021–22 THROUGH 2029–2030)	PROJECTED ADDITIONAL AWARDS BY PROGRAM – WITH HS GRAD RATE AT AVERAGE OF BEST-PERFORMING STATES (2021–22 THROUGH 2029–2030)
	COMPUTER & INFORMATION SCIENCE	COMPUTER & INFORMATION SCIENCE
Certificates	4	6
Associates	7	11
Bachelor's	11	18

Increasing the College-Going Rate

As with all of higher education in Idaho, college-going rates are projected to have an impact on computer and information science degree production. If Idaho were to achieve the national average go-on rate of 47% for in-state students directly out of high school, the model suggests that could lead to 29 additional bachelor's degrees in computer and information science over the course of the projections. If the state were to approach a more aspirational goal — such as the nearly 58% seen in state's with the highest go-on rates — that original number more than quadruples, with 45 additional degrees projected.

Table 35. Projected additional undergraduate computer and information science awards with increases in the college-going rate of direct out of high school (DHOS) students in Idaho

	PROJECTED ADDITIONAL AWARDS – CURRENT TRENDS (2021–22 THROUGH 2029–2030)	PROJECTED ADDITIONAL AWARDS – DOHS COLLEGE-GOING RATE AT NATL. AVG. (2021–22 THROUGH 2029–2030)	PROJECTED ADDITIONAL AWARDS – DOHS COLLEGE-GOING RATE AT BEST-PERFORMING AVG. (2021–22 THROUGH 2029–2030)
	COMPUTER & INFORMATION SCIENCE	COMPUTER & INFORMATION SCIENCE	COMPUTER & INFORMATION SCIENCE
Certificates	4	10	15
Associate	7	18	27
Bachelor's	11	29	45

Increasing Out-of-State Students

Looking at the impacts of increasing the number of out-of-state students enrolling directly out of high school, we can see that this is projected to double the number of additional bachelor's degrees, but has less of an impact on associates degrees and certificates (similar to the findings in engineering and engineering technology).

Table 36. Projected additional computer & information science undergraduate awards with increased out-of-state directly out of high school (DOHS) college-going numbers

	PROJECTED ADDITIONAL AWARDS – CURRENT TRENDS (2021–22 THROUGH 2029–2030)	PROJECTED ADDITIONAL AWARDS – OUT-OF-STATE DOHS COLLEGE-GOING INCREASED 10% (2021–22 THROUGH 2029–2030)	PROJECTED ADDITIONAL AWARDS – OUT-OF-STATE DOHS COLLEGE-GOING INCREASED 20% (2021–22 THROUGH 2029–2030)
	COMPUTER & INFORMATION SCIENCE	COMPUTER & INFORMATION SCIENCE	COMPUTER & INFORMATION SCIENCE
Certificates	4	4	4
Associate	7	8	9
Bachelor's	11	18	25

Increasing College Participation of 20–44-year-olds

Increasing the rate of first-time college participation of the state's 20–44-year-old population to national and high-performing state averages has a particularly strong impact on the projected production of computer and information science bachelor's degrees, which rise to 52 additional degrees produced over the projection period.

Table 37. Projected additional undergraduate computer & information science awards with an increase in first-time (FT) college participation rates of 20–44-year-olds.

	PROJECTED ADDITIONAL AWARDS – CURRENT TRENDS (2021–22 THROUGH 2029–2030)	PROJECTED ADDITIONAL AWARDS – FT PARTICIPATION RATE AT NATIONAL AVG. (2021–22 THROUGH 2029–2030)	PROJECTED ADDITIONAL AWARDS – FT PARTICIPATION RATE AT BEST-PERFORMING AVG. (2021–22 THROUGH 2029–2030)
	COMPUTER & INFORMATION SCIENCE	COMPUTER & INFORMATION SCIENCE	COMPUTER & INFORMATION SCIENCE
Certificates	4	9	20
Associate	7	15	34
Bachelor's	11	23	52

Improving Postsecondary Progression Rates

As with engineering, improving progression year-over-year in postsecondary does increase the number of additional degrees produced more significantly than increasing the high school graduation rate, but less so than increasing college participation.

Table 38. Projected additional undergraduate computer & information science awards with a 10% increase in retention rates

	PROJECTED ADDITIONAL AWARDS – CURRENT TRENDS (2021–22 THROUGH 2029–2030)	PROJECTED ADDITIONAL AWARDS – 10-PERCENTAGE-POINT INCREASE IN RETENTION RATES (2021–22 THROUGH 2029–2030)
	COMPUTER & INFORMATION SCIENCE	COMPUTER & INFORMATION SCIENCE
Certificates	4	21
Associates	7	32
Bachelor's	11	30

Student Flow Model Conclusions

Similar to engineering, the model levers possible with the available data show us that impacting college participation will be a key factor in increasing degree production at the bachelor's level in computer and information science, while important questions such as breakdowns by gender and major choice remain unanswered.

Computer & Information Science Demand

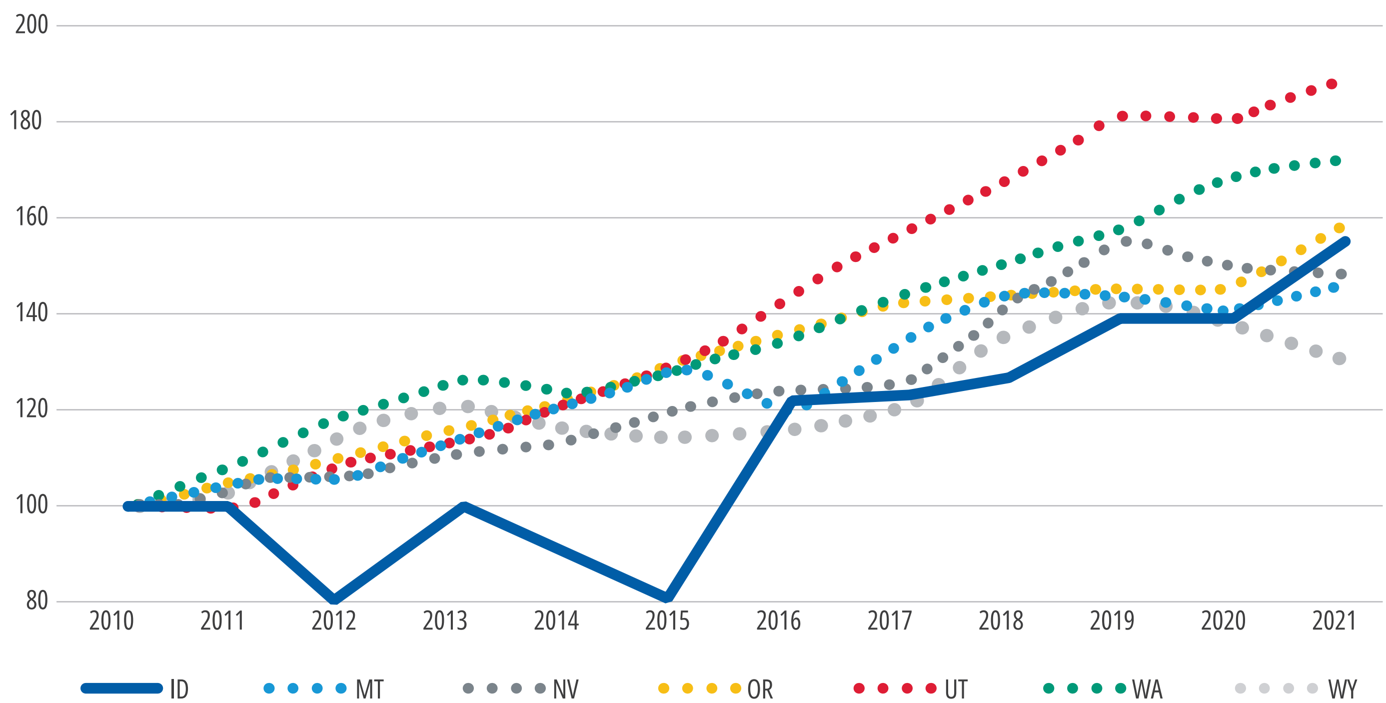
Key Findings

Historical trends that show growth in computing employment over the last decade, projections that predict continued occupational growth, and recent qualitative data that suggest hiring demand is already exceeding these growth projections demonstrate a robust labor market for graduates with degrees in computer-related fields.

Historical Data

From 2010 to 2021, employment in computing occupations in Idaho grew substantially, with BLS estimating 12,050 Idahoans were employed in computer occupations in 2010 and 18,750 by 2021. This growth trend was present across the Northwest, with Utah leading the way in terms of growth trajectory.

Figure 11. Computer Science employment growth in Idaho and surrounding states



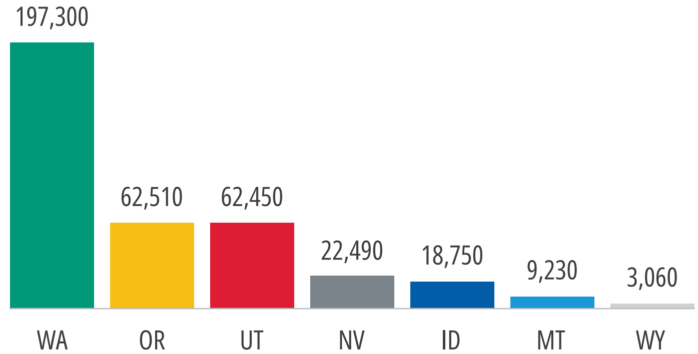
Note: *Data are indexed where 100 = Number of Jobs in 2010*

Source: Bureau of Labor Statistics, Occupational Employment Statistics (OES) Survey

As with engineering, the total number of employees in computing occupations varies widely in the region, with Washington employing the greatest number by a large margin. Overall, employment in computer occupations is substantially higher than in engineering occupations over the same time frame, with computer occupations employing roughly double the number of estimated workers in engineering.

The combination of ongoing regional growth and large labor markets in neighboring states suggests that Idaho's graduates in computer-related fields will likely have competing employment opportunities in surrounding states.

Figure 12. Computer occupational employment in Idaho and surrounding states (2021)



Source: Bureau of Labor Statistics, Occupational Employment Statistics (OES) Survey

Importantly, computer occupations are among the occupational types that have undergone some of the greatest changes over the past few decades. New job types have emerged that didn't exist a decade ago, while others have become obsolete. This is one argument for continuing to look at computer occupations in a broad sense, as a targeted focus on more detailed occupation types might end up being difficult to track over time as occupational classifications shift.

Nonetheless, the field does incorporate a variety of occupational types with quite a range in key attributes such as skillsets required, educational qualifications needed, and median salaries. There may be specific areas of focus for the state, such as software development or cybersecurity, as well as potentially emerging areas related to the development and use of technologies loosely known as artificial intelligence (AI), that warrant special attention.

Projections

Computer-related occupations are projected to grow considerably in both Idaho and across the United States in the coming years, increasing by more than 12% between 2020 and 2030 in Idaho and by nearly 15% between 2021 and 2031 nationally (this is compared to a 5% growth rate for all occupations). According to the ID DoL's 2020–2030 projections, the state can expect to see 1,387 annual openings due to turnover and growth in computer-related occupations each year till 2030.[47]

Remote Work

Another factor that increases the difficulty in accurately projecting the number of available jobs in coming years is the rise in remote work — which is especially common in computer-related occupations. As businesses have the option of hiring from anywhere, employer interviews revealed a few key points:

- Some Idaho-based technology companies will hire locally, if talent is available but they will hire remote workers if not.
- An increasingly remote tech workforce offers opportunities for Idaho's graduates to work for companies either within or outside of the state — while still contributing to the state's tax base.

It is also important to understand that shifts in industry mix are not reflected in the projections' methodology. For example, as advances in computing led to the automation of clerical work the number of clerical jobs declined, but the number of jobs in information technology grew — meaning that jobs shifted from one industry to another over time.[48] Future shifts towards automation could certainly change the projected growth trajectory of computer occupations. Though past trends suggest that these shifts in industry mix might lead to more jobs in computer-related occupations, rapidly evolving technologies such as artificial intelligence add a layer of uncertainty.

The projections also do not reflect national trends in 2022 and early 2023 which have featured some large-scale layoffs at major technology companies. However, early evidence suggests that, in many cases, those laid off were able to find alternative employment within their occupational field. This highlights the distinction between occupations and industries. It is possible that industries — such as the tech sector — may expand and contract without a corresponding impact on occupations, as other industries like healthcare, retail, and finance continue to expand their hiring demand for computer-related occupations such as software engineers and developers.[49]

Employer interviews also suggested an extremely strong demand for mid-career computer science professionals — particularly among Idaho's burgeoning start-up sector. Some interviewees felt that the layoffs from large multi-national corporations might even offer opportunities to hire for traditionally difficult-to-fill roles. Further, multiple smaller, earlier stage tech startups noted that while they typically hire later career talent in their initial phases, they plan to hire more entry-level (just out of school) talent as they expand and have more capacity to train less experienced staff. Therefore, expanded availability of mid-career tech talent could possibly support growth and have a positive impact on future demand in certain scenarios.

Alternatively, rising interest rates which increase the cost of borrowing — a posited contributor to the tech sector layoffs — will likely also negatively impact the growth and hiring demand of Idaho's technology-focused businesses. For example, one technology company noted a recent hiring freeze.

Large-scale, macro-economic trends such as a cooling economy or possible recession would also negatively impact the demand for workers in this occupational field, and this possibility cannot be ignored. However, while not predictive, existing research on Utah's engineering and computer science growth initiative from 2000–2020 shows that the 2008 recession resulted in a short-term flattening of available jobs in the two fields, which then rebounded in subsequent years.[50]

Employer Survey

The employer survey was focused on employers in the engineering and technology sectors, meaning those for whom a large percentage of their workforce is made up of employees with credentials in engineering and computer and information science fields. However, as discussed in preceding sections of the report, computer occupations span a wide variety of industries with employers in all sectors increasingly needing talent with computer-related skills. It is likely the lower share (relative to engineering) of computing employees reached by the survey in comparison to state totals reflects the difficulty in reaching the many different types of employers who employ those in computer occupations. Nonetheless, the survey was able to capture valuable feedback from a robust number of employers with computer-related hiring demand.

Table 39. Survey respondent computer-related employees vs. overall number of Idaho computer-related employees

	STATE TOTAL 2020	STATE TOTAL 2023 (ESTIMATED)	SURVEYED COMPANIES (ESTIMATED)*
Computer Occupations (15–1200)	15,821	19,588	3,856

**Survey response options were presented as ranges and these totals assume a midpoint value of the selected range.*

Among employers looking to hire candidates with degrees in computer-related fields, nine percent were looking for associates degrees, 72% bachelor's degrees, nine percent for masters degrees, and seven percent for doctoral degrees. Similar to engineering, this suggests that a focus on bachelor's degrees would most align with employers' overall needs — though some companies do have specialized needs for candidates with advanced degrees as well as at the associates level.

Computer & Information Science Gap Analysis

The available quantifications of supply and demand indicate a gap between the number of computer-related graduates from Idaho public institutions and the needs of Idaho's employers. The magnitude of the gap differs depending on the exact specifications used and will remain sensitive to the evolving nature of the field.

Considerations

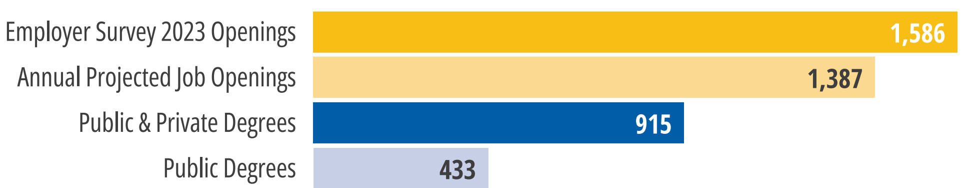
- **Relationship Between Degrees & Skills-based Hiring**: Because of employers' strong preference for demonstrable skills over specific degree types, a key factor in maintaining demand for Idaho's computer and information science graduates will be ensuring that programs offer strong preparation in foundational skills and industry-relevant curricula.
- **Institutional Sector**: The focus of this work is public institutions and their degree production, however, private institutions — in particular BYU-Idaho — also play a key role in producing graduates. Considering how to include the impact of private institutions is another question for future study.
- **Migration**: The evolving nature of remote work, especially given recent trends of large-scale layoffs from major technology companies, has an uncertain directional impact on Idaho's demand for tech workers. Yet Idaho's strong history of retaining both in- and out-of-state graduates of computer and information science programs in their workforce suggests increasing the local supply of tech talent could have advantages for both Idaho's employers and the state's tax base.

- **Time Horizon**: Projections by nature become less reliable the farther they stretch from baseline data. As a result, short-term projections have the greatest likelihood of accuracy. For this reason, numerical gaps are only presented for a 12-month period. The available data suggest that the gap between supply and demand will widen over time as Idaho (without intervention) produces only a very modest additional number of computer and information science graduates year-over-year and employer hiring demand rises to 2,216 job openings for candidates with degrees in computer and information science by 2028 (as indicated in the employer survey). Yet the demand-suppressing effects of workforce shortages that can lead employers to limit growth or relocate as described in interviews might ultimately drive down the overall amount of hiring demand. It's important to note that while the "gap" between supply and demand would lessen in this scenario, Idaho's economy would still be losing out on potential growth.

Summary

The available numbers (see Figure 13) and the robust employer demand expressed in survey responses and interviews suggest that Idaho's labor market would benefit from a significant increase in the number of computer and information science graduates. However, supply modeling shows that the pipeline of students prepared to enter and succeed in Idaho's programs is not large enough to drive the increases Idaho employers are looking for. Taken together, these results suggest an investment in Idaho's student pipeline is needed.

Figure 13. Idaho degree production for computer and information science compared to projected job openings and employer demand



Sources: Integrated Postsecondary Education Data System, Idaho Department of Labor Occupation Projections (2020–2030), WICHE Employer Survey

NEXT STEPS

Although this document is not intended to be a traditional strategic plan, it can be thought of as a framework for how the state might move forward on an initiative to increase production and retention of engineering, engineering technologies, and computer science. Although there is not a single clear data point or analysis that fully proves the state is facing shortfalls in these fields, WICHE's conclusion, based on a range of available evidence, is that there is a strong need to increase the number of skilled, educated, and trained workers in these fields. Failure to meet this demand may not show up as an immediate crisis, but instead would be evident in missed opportunities for economic growth and increases in the number of sustainable, well-paying jobs. :

The other central conclusion, hopefully made abundantly clear from the data analysis presented throughout this report, is that Idaho faces a completely different context and demographic situation compared to Utah in 2000. Capacity constraints in postsecondary education are not currently the limiting factor in the production of graduates in these fields. This is not to say that those programs may or may not need investment to stay current and ensure high-quality programs (a question that is beyond the scope of this report). Instead, the substantial focus of any initiative must be on changing the underlying factors of the pipeline first. As more students select into these fields, capacity may become a bigger issue, but currently, that is not as big a problem as declining college go-on rates and the relatively low number of students that are prepared to enter and succeed in these fields.

The rest of this section identifies potential next steps to develop a growth initiative that is driven by data and evidence and led by industry experts.

Creating a Shared Vision & Coordinated Plan

The available evidence is compelling that Idaho would benefit from a growing pipeline of well-trained engineers, engineering technicians, and computer and information science professionals. Idaho's public institutions have a strong record of producing successful graduates in these occupations, yet the overall number of graduates has not kept pace with industry demand in Idaho's growing economy.

Generating additional graduates in these high-demand fields is a complex, long-term endeavor. The downward demographic trends driving the overall number of high school graduates Idaho is expected to produce paired with the state's declining college go-on rates mean the state is facing significant headwinds as it seeks to increase supply. While Utah's successful growth initiative took place in a high-growth context (both demographically and economically), Idaho will face a more challenging environment for a similar effort. Moreover, addressing the multifaceted challenges of demographic and large-scale educational trends such as the college go-on rate will require the development of equally multifaceted responses.

Single sector or piecemeal efforts will be inadequate to address this challenge, so the state must develop a shared vision for growth in these fields, ensuring that all that relevant partners from industry, policy, and education are at the table. As the ultimate beneficiary and subject matter expert, industry is well-positioned to take the lead in guiding this work.

Three key questions to answer in establishing this vision will be:

- What entity will lead this effort?
- What is the overarching goal?
- What is the scope of the effort?
  - What fields will it encompass?
  - What degree and/or credential types will be included?
  - Will the focus be on public institutions or all institutions in the state?
  - How will it address issues outside of the education pipeline, such as retention of graduates in Idaho?

Once a shared vision for the state's engineering and computer and information science workforce pipeline is established, the focus must be on actionable steps to take the vision from theory to reality. ¬The initiative partners must identify the combination of short- and long-term strategies they will pursue as part of a coordinated plan to achieve their goal, and the metrics they will track along the way to determine successes and necessary course corrections.

Key questions to answer as a coordinated action plan is crafted will be:

- What long-term actions must be taken to achieve the vision?
- What short-term actions must be taken to achieve the vision?
- What metrics will need to be tracked to determine success? (more discussion presented below)
  - Do these data currently exist and if so, are they being collected?
- Who will be responsible for monitoring progress and making decisions along the way?

This approach should also situate the effort in Idaho's broader economic context, considering the overall realities of the state's labor market and pressing shortages in other STEM fields such as healthcare.

Identifying Clear Roles & Responsibilities

As partners in this work, industry, policymakers, universities, community colleges, and the K–12 sector should identify how they will individually and collaboratively contribute to achieving the shared vision through the identified short- and long-term strategies.

A critical element will be the statewide framing and approach. Each group of partners must come to the effort prepared to contribute to the development and execution of the statewide vision, exploring how they are best positioned to leverage their unique resources to contribute to the overall goal. Rather than individual plans and targets, each partner should have clear responsibilities mapped out that will collectively lead to the achievement of the statewide goal(s).

For example — given the results of the supply analysis — postsecondary institutions (both two- and four-year institutions) may wish to initially focus on building their pipeline of potential students. In many cases this may include building on and investing in ongoing efforts in these areas.

- Partnering with K–12 to improve the math preparedness of high school graduates and generating more interest in these fields.
- Collaborating across the two- and four-year sectors to improve transfer pathways, and
- Engaging non-traditional students such as those who have never attended postsecondary, those who attended and stopped out (especially with substantial credits in fields of interest), or those looking to shift careers or upskill within the field.

Another important element will be identifying the current and needed capacity of existing higher education programs in the fields of interest. Specifically, the state will want to review available data and collect needed data to identify the gaps between current capacity and the capacity needed to achieve the goal(s) set by the visioning process. A sample capacity assessment rubric is included in Table 40.

Table 40. Sample capacity assessment rubric

ELEMENT	CONSIDERATIONS	IDEAL CAPACITY	CURRENT CAPACITY	INVESTMENT
Faculty	• What type of faculty are needed? • What resources (labs, etc.) will they need to be successful? • Are there opportunities to share high-cost faculty positions across institutions?	• What are ideal student-faculty ratios for offering high-quality programs in the fields of interest? • How many faculty, by type, would be needed to offer the number of credit hours required by the target number of students?	• How many faculty are currently employed in the fields of interest and how many credit hours can they teach?	• What level of investment would be needed to go from current to ideal capacity? • Which investments would produce maximum impact in a constrained funding environment?
Students	• What types of additional student supports (ex. advising, tutoring, etc.) are needed to support successful entry into and progression through these programs? • What resources can be shared at the state level ?	• What evidence-based supports would a student in the fields of interest ideally have access to?	• How many of these support services are currently offered? • Where are there gaps in terms of availability and capacity of current services?	• What level of investment would be needed to go from current to ideal capacity? • Which investments would produce maximum impact in a constrained funding environment?
Space & Equipment	• What facilities (classroom space, labs, etc.) are needed to offer these programs at a high level of quality? • How can institutions work together to jointly leverage assets?	• What space and facilities would these programs have in an ideal scenario?	• What space and equipment resources does the institution currently have?	• What level of investment would be needed to go from current to ideal capacity? • Which investments would produce maximum impact in a constrained funding environment?

Meanwhile, industry partners might commit to employee upskilling initiatives, provide equipment and internship or project opportunities that meaningfully address challenges identified by educational partners, and provide timely and actionable feedback to educational partners.

Given the demographic trends of Idaho's youth population, an important area of focus for all partners should be identifying how to identify, attract, and support non-traditional-aged students through to degree completion. There are numerous potential audiences for this approach, including employees at existing firms that have interest in advancing their careers through additional education, students who have stopped out of these programs with a substantial number of credits, and other working Idaho residents who are in related fields. This outreach should be paired with effective policies and practices, including employee tuition assistance, strong prior learning assessment, and other approaches that serve adult students.

Investing for Impact

In order to make the most of any investment, the partners must identify and prioritize the greatest barriers and most effective solutions to increasing workforce supply. Engineering and computer-related fields encompass a broad range of credentials and specialties that lead to a variety of occupations. The collective effort may consider if a broad or a targeted approach will be most effective for meeting their goals with available funds. As part of this analysis, they should also focus on leveraging Idaho's unique assets in both industry and education for maximum value. Finally, it will be critical to balance immediate employer needs with sustainable growth plans that have the flexibility to account for changing dynamics such as recessions and shifts in automation.

While this report does not attempt to place a dollar figure on a level of state investment that is appropriate (due in part to the need to effectively set the stage for exactly how such an initiative will produce growth), it is likely that this will lead, if successful, to needs for additional state resources.

But it is also clear that such an initiative will require investment and contributions from industry. Contributing time and thought to leading such an initiative is only the first step. Additionally, it may require industry investment to aggressively support additional employee education and training opportunities and to help address the large percentage of engineering graduates that appear to be leaving the state.

It is important to recognize that this work will not take place in a vacuum, with substantial state-wide attention and effort focused on improving college go-on rates, addressing worker shortages in healthcare, education, and other fields, and major recent policy changes such as the new funding available for the Idaho Launch program. Ensuring that the vision and plan for this initiative functions within this broader context can help make investments of all parties more effective and efficient rather than redundant or duplicative.

Data, Metrics, and Research

Most reports that lay out how an initiative like this could be successful include a section on improving data and metrics and carrying out additional research. While this is a common approach, that does not make it any less important. A thorough and detailed data analysis shifted WICHE's initial expectations for charting out how this initiative might best proceed. Initially, our thought was that the Utah work seemed very effective and essentially following that model would serve Idaho well. As has been clearly laid out, though, the different state contexts suggest that Idaho must follow a different approach to reach the same goal.

As part of this framework, WICHE recommends that industry leaders and other key agencies and organizations coalesce around meaningful metrics for understanding how the initiative that is envisioned is impacting outcomes. Essentially, the initiative should develop a set of key metrics that it hopes to shift through policy and practice. These will likely include readily available administrative data, such as enrollments and completions in these programs, but also more complex analyses including retention in state of recent graduates, medium-term migration and employment patterns of recent graduates, student interest in these fields, and more. It would be easy to focus solely on the number of graduates in each field that are produced annually, and we agree that is an important metric. But if, for example, the number of students enrolled in public postsecondary institutions in the state declines substantially, but the number of graduates in these fields holds steady, that would be a sign of some success. This report contains numerous different data points and ways of considering supply and demand issues. Certainly not all of the data points will resonate, but they could represent a starting point for consideration. As an initiative unfolds, it is highly doubtful that every approach and policy change will bear fruit, but with a successful monitoring and evaluation approach, it will be possible to continuously refine efforts to improve outcomes.

Additionally, it is highly likely that the initiative will benefit from a strong research and evaluation plan. As new policies, programs, or approaches are tried, it is essential that some form of evaluation takes place to assess their effectiveness and potentially lead to improvement. It is also likely that the work would benefit from research on certain topics. As one example, better understanding the clear gender gaps is essential. It may be that as professions, engineering and computer science never end up with equal numbers of males and females, but the data clearly show that there are a large number of females who would likely succeed, but are choosing different paths.

Additionally, it should be clear from this report that qualitative data from surveys and interviews are essential to gaining a full perspective of not just what is happening, but why.

Ultimately, this will be a difficult and complex undertaking, but there is strong evidence that it is highly needed for Idaho. Effective use of data and research will help ensure success, efficient use of investment, and better overall outcomes for Idaho and its students.

The state is blessed with a strong data system and an insightful research team at the State Board of Education. Certainly, there are always competing priorities and limits on staff capacity, but the state has plenty of existing infrastructure to provide an effective data infrastructure to support this work.

ACKNOWLEDGEMENTS

Industry Advisory Team

This initiative was guided by a core advisory team of industry representatives. These leaders in Idaho's engineering and technology sectors generously dedicated their time and expertise to inform the project, offering extensive feedback on the scope and design and making critical connections with their colleagues across Idaho in support of employer engagement efforts. The team met six times between November 2022 and April 2023, in addition to providing feedback on survey design, interview and survey outreach, and the preliminary findings.

Industry Advisory Team Members

- Elli Brown, Director, State and Local Government Affairs, Idaho National Laboratory
- Tim Haener, Chairman and Corporate Risk Manager, J-U-B Engineers & Industry Advisory Board Member, University of Idaho College of Engineering
- Jim Gasaway, Industry Advisory Board Chair, Boise State University Department of Computer Science
- Jay Larsen, President, Idaho Technology Council
- Tom Loutzenheiser, Industry Advisor Board Chair, Boise State University College of Engineering
- Dee Mooney, Executive Director, Micron Foundation
- Alan Prouty, Vice President, Environmental & Regulatory Affairs, J.R. Simplot & Industry Advisory Board Chair, Idaho State University College of Science & Engineering
- Ryne Stoker, Chief Executive Officer, President, and Principal Engineer, GeoTek and Industry Advisory Board Chair, University of Idaho College of Engineering

Report Contributors

This report would not have been possible without vital contributions from a variety of individuals, including: the Idaho Office of the State Board of Education (OSBE) staff — in particular the leadership and coordination of Scott Greco and the partnership and data expertise of Cathleen McHugh and Andy Mehl; the data modeling of the National Center for Higher Education Management Systems led by Johnna Clark and Louisa Hunkerstorm; and the graphic design talent of Cathy Calder of Blonde Ambition Inc. and the editing support of Annie Sugar.

Additional insights from the Idaho Department of Labor — particularly Craig Shaul and Samuel Wolkenhauer — as well as from Hope Morrow, Idaho National Laboratory's Manager of Workforce and Economic Programs, were invaluable. Finally, the employer survey would not have been possible without the expertise of Hope Swann at the Idaho Technology Council. While all of these individuals were incredibly helpful and patient with their time and expertise, any errors, omissions, or misinterpretations are not their fault, but WICHE's.

Employers

Employers across Idaho made time in their busy schedules to offer their feedback on the issues raised in this report. We deeply appreciate the time they took to reflect on the importance of an engineering and computer and information science trained workforce to their companies' success. Their perspectives constitute a critical piece of this analysis and their ongoing engagement will be key to continued progress.

TECHNICAL APPENDIX

Student Data Analyzed

Public Education Pipeline Model

This the rationale and overall scope of the data WICHE requested for the analysis in the foregoing report. WICHE proposed to develop and provide a projection model for degree production in key majors for engineering and computer and information science by Idaho public postsecondary institutions. This work also shows key leakage points and identifies important metrics for future monitoring and evaluation of efforts to increase production.

This model can only estimate supply from public education sources. In its reporting, WICHE identifies to what extent Idaho K–12 and public postsecondary students contribute to overall degree production for engineering and computer and information science, and what other sources supplement this in Idaho. The parameters of the projections (i.e. the number of years into the future the model covers) were determined by the available data.

To produce this analysis, WICHE proposed using aggregated data to create a cohort-based flow model, and using individual-level data across cohorts of high school graduates and postsecondary enrollees and credential completers to build a model of the pipeline for producing graduates in engineering and computer science.

The research questions included:

1. Based on current and recent historical trends, how many credentials in engineering and computer science are Idaho's public institutions expected to produce?
2. At what point in their enrollment progression do students entering postsecondary enter into major programs of interest?
3. At what point(s) in enrollment progression, and to what extent/volume, do students transition out of engineering and computer science majors, or from other majors into these?
4. What factors are associated with postsecondary students entering into these majors?
5. What factors are associated with credential completion in these majors and programs? Of switching program or stopping out?
6. What factors are associated with student success for first time and transfer students?
7. What factors are associated with employment in Idaho?
8. At what rate do students who stop out return, and when they do, are they successful? (this was anticipated for the earlier cohort initially proposed, which was not included due to data limitations)

9. How has "leakage" changed over time? Key analysis points:
    1. What pct. Of high school graduates enter postsecondary within 3 Years?
    2. What pct. of CIP-entrants complete 25% of credits necessary for graduation within X years? 50%? 75%? 100%? (Compare 2013–14, and 2018–19 entering cohorts)
    3. What pct. of CIP graduates are employed in the universe of businesses covered by Idaho unemployment insurance within 1, 5, and 10 years?

Description of Students Covered

This appendix highlights some high-level information about the students included for the analysis in the report, for context, and is not an exhaustive data dictionary or the like. Important things to keep in mind about the resulting dataset(s) compiled from the data received from the Idaho OSBE:

- Results may be affected, although presumably marginally, by errors or anomalies in the data provided to WICHE. As well, these results may 'over-simplify' or mask some complexity and nuance that are inherent to postsecondary enrollment and completion student behavior and data patterns. Further research, planning and tracking should include deliberate data preparation and review, to account for and represent more myriad and nuanced patterns than were intended for this 'snapshot' of results.
- The results in this appendix generally summarize the highest observed postsecondary awards among the covered students, and do not specifically tabulate students who earned multiple of the same 'highest award' (e.g., two Bachelor's). Further research, planning and tracking should consider the incidence of multiple awards, including among computer and information science and engineering graduates. And the results in this appendix focus on the completion and degree outcomes of the students, and for the most part, not their enrollment patterns.

Cohort Flow Model Aggregated Data: Student Counts, FTE and Graduates, by Categories

This approach builds from WICHE's existing work on High School graduates and is based on aggregated student data, that has been compiled to the state-level by WICHE from publicly available sources supplemented by student-level data requested here. The model is based on enrollment and graduation data from K–12 in Idaho and enrollment and completion data from Idaho's public postsecondary institutions.

This results in a product similar to WICHE's Knocking at the College Door, projecting the number of graduates in CIP codes of interest.

Aggregated Data Request

WICHE requested public school K–12 enrollment counts (October census headcounts), by grade, and the number of high school graduates, for school years 2020–21 and 2021–22. Note: State-level counts were requested, at a minimum; the data and timeline did not support detailed analysis within state (e.g., by education region or school district), but this level of analysis might be relevant for further analysis, for identifying regional differences in potential school populations.

WICHE also requested counts of degree-seeking postsecondary students, by declared major (CIP), and enrollment and awards completed for Idaho public postsecondary institutions (Assoc, Bach, Masters, and PhD) by CIP Code for academic years 2016–17 through 2021–22 (fall 2022–23 data were not available for this report).

For postsecondary enrollment, WICHE also requested that four-year students be categorized into groupings representing <20%, 40%, 60%, 80%, and >100% of progress towards the number of credits necessary for degrees, for each academic year, by CIP (in categories of <33%, 66%, and >100% progress towards the number of credits necessary for two-year/Associate's degree students).

For graduate degrees/students, WICHE requested that students be grouped into numbers initially enrolled, at intermediate progression points evident in the data, and number who completed by award type and CIP. These data were requested for academic years 2016–17 through 2021–22. For all of the aggregated information, WICHE requested disaggregation by race/ethnicity, gender, and income flag (economic disadvantage status), but analysis by these categorizations was ultimately not part of the analysis due to data limitations and low cell counts.

Ultimately, only six categorizations were available in the data for the cohort flow model: academic year 2016–17 to 2021–22, at 2-year or 4-year institution, whether student was directly from high school or other enrollment status. Thus, details such as student sex, race/ethnicity or transfer status were not able to be modeled from the available data.

Note: *For brevity, not all details are presented in the tables below. Also provided were full-time equivalent and percent of progress towards credits required for degree.*

Head counts by Related Major and Years Enrolled, 2016–17 to 2021–22
a. Idaho Public Postsecondary Four-Year Institutions

MAJOR	ACADEMIC YEAR	ID PUBLIC HIGH SCHOOL GRADUATES ENROLLED IN YEAR AFTER GRADUATION ("IMMEDIATE COLLEGE-GOING")					OTHER					TOTAL	HIGH SCHOOL GRADUATES % TOTAL OF YEAR ONE STUDENTS
		ONE	TWO	THREE	FOUR	FOUR +	ONE	TWO	THREE	FOUR	FOUR +		
Computer and Information Sciences and Support Services	2016–17	229	158	121	101	170	239	201	180	144	363	1,906	49%
	2017–18	192	171	130	111	205	265	177	153	131	333	1,868	42%
	2018–19	225	137	142	119	227	237	206	143	107	321	1,864	49%
	2019–20	170	160	115	131	230	197	189	155	115	295	1,757	46%
	2020–21	202	131	134	102	266	217	165	140	124	276	1,757	48%
	2021–22	208	157	128	125	260	294	157	133	113	269	1,844	41%
Engineering	2016–17	354	271	252	194	280	529	551	581	403	936	4,351	40%
	2017–18	308	261	246	234	327	529	428	402	390	848	3,973	37%
	2018–19	316	209	222	212	377	426	410	348	280	802	3,602	43%
	2019–20	291	243	194	206	398	424	307	319	276	669	3,327	41%
	2020–21	287	209	191	181	399	374	333	243	275	597	3,089	43%
	2021–22	318	189	200	180	394	380	285	266	212	533	2,957	46%
Engineering/ Engineering-Related Technologies/ Technicians	2016–17	40	36	19	18	27	51	48	43	29	99	410	44%
	2017–18	51	37	33	11	34	42	52	33	28	85	406	55%
	2018–19	48	40	27	27	33	55	43	35	19	95	422	47%
	2019–20	67	28	27	14	52	62	37	26	26	84	423	52%
	2020–21	58	51	20	26	53	66	50	32	20	75	451	47%
	2021–22	35	41	31	16	48	63	53	34	19	68	408	36%

b. Idaho Public Postsecondary Two-Year Institutions

MAJOR	ID PUBLIC HIGH SCHOOL GRADUATES ENROLLED IN YEAR AFTER GRADUATION ("IMMEDIATE COLLEGE-GOING")					OTHER				TOTAL	HIGH SCHOOL GRADUATES % TOTAL OF YEAR ONE STUDENTS
	ACADEMIC YEAR	ONE	TWO	THREE	THREE +	ONE	TWO	THREE	THREE +		
Computer and Information Sciences and Support Services	2016–17	100	65	29	43	114	69	33	108	561	47%
	2017–18	95	74	55	72	121	79	37	109	642	44%
	2018–19	124	55	48	103	115	64	45	114	668	52%
	2019–20	144	106	52	162	106	74	50	116	810	58%
	2020–21	115	70	59	156	84	68	51	84	687	58%
	2021–22	137	90	70	201	102	60	45	86	791	57%
Engineering	2016–17	21	12	10	8	37	25	8	23	144	36%
	2017–18	19	12	5	15	30	18	9	25	133	39%
	2018–19	50	21	14	24	39	26	11	25	210	56%
	2019–20	73	34	16	55	72	31	16	37	334	50%
	2020–21	49	42	29	53	43	37	20	30	303	53%
	2021–22	62	31	32	47	46	29	25	34	306	57%
Engineering/ Engineering-Related Technologies/ Technicians	2016–17	34	30	10	22	54	25	21	52	248	39%
	2017–18	32	26	17	27	57	32	15	62	268	36%
	2018–19	26	20	17	34	44	32	22	59	254	37%
	2019–20	29	23	17	56	38	34	18	64	279	43%
	2020–21	17	16	20	33	25	24	18	35	188	40%
	2021–22	37	14	15	27	34	17	13	24	181	52%

Progression Model Individual Level Data: High School Graduate, Other First-Time College Students and Degree Completer Cohorts

This model complements the pipeline projections by identifying points in the Idaho public postsecondary credential pipeline (particularly for associates and bachelor degrees) where there is "leakage". This model uses recent and historical data to identify student characteristics associated with:

- Entrance into majors related to engineering and computer science
- Retention in those fields of study/programs
- Completion of those credentials from those programs
- Subsequent employment in Idaho

This modelling relies on student-level datasets of three cohorts. Overall, there were over 94,000 individuals represented in the data from Idaho OSBE.

Idaho Public High School Graduates for the Progression Modeling

A primary focus of the progression analysis in this report relates to Idaho public high school graduates of the Classes of 2012–13 and 2017–18, and their postsecondary enrollment and completion (Note: WICHE initially requested a third, earlier cohort year, but there were limitations in the data prior to 2013–14, particularly K–12 data).

	TOTAL	NOT COLLEGE-GOING		WENT TO COLLEGE WITHIN ACADEMIC YEAR			WENT AT LATER POINT	
2012–13	16,731	4,688	28%	9,254	(AY 2013–14)	55%	2,789	17%
2017–18	18,926	7,116	38%	9,668	(AY 2018–19)	51%	2,142	11%

While they were not the primary focus of the analysis presented in the report, there were additionally almost 14,000 Idaho public high school graduates available to analyze from graduating classes 2004–05 to 2021–22, who were in the sample because they either enrolled in college or university for the first (known) time in the 2013–14 or 2018–19 academic years (related to Cohort 2 on page 73) or received a postsecondary credential in 2016–17 or 2021–22 (related to Cohort 3 on page 73).

Notes: *Distribution of Idaho public high school graduates from years other than 2012–13 and 2017-18 is not tabulated, because they were incidentally included in the drawn cohorts and do not describe comprehensive patterns for those other graduating class years. 'Received a (related) credential' within nine years for 2012–13 high school graduates, within four years for 2017–18 high school graduates. City-to-rural schema in use by the National Center for Education Statistics for representing the geographic nature of schools' populations. 'Related field' and 'Credential' were CIP 11, 14, or 15, as throughout this report*

- Idaho public high school graduates from regions four and six were the most under-represented among the high school graduates who completed an engineering or computer science/information services credential, in this sample; high school graduates from region three were over-represented.

- High school graduates from schools categorized as 'city' or 'suburb'
- Male high school graduates were less likely (62%) than females (73%) to enroll in postsecondary at any point covered by the sample, but were significantly over-represented among those who ever majored in (male: 88%) or completed an engineering or computer science/information services credential (male: 81%).

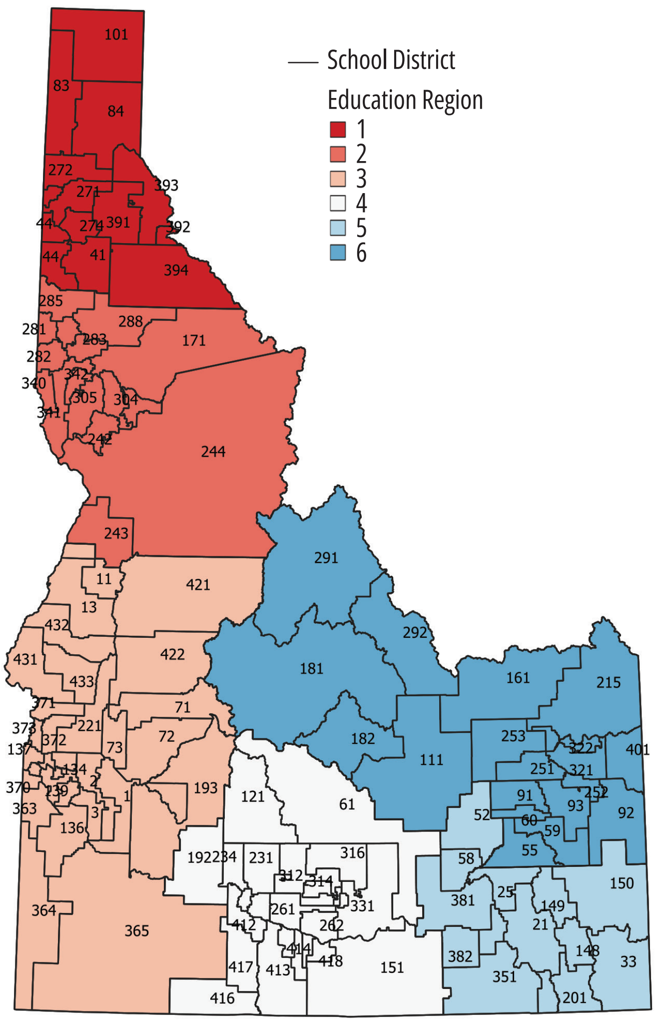
By Education Region

			FIELDS OF INTEREST	
	PERCENT OF TOTAL	ENROLLED POST-SECONDARY (AT ANY POINT)	MAJORED (IN ONE OR MORE TERMS)	RECEIVED CREDENTIAL
One	11%	11%	12%	11%
Two	5%	5%	5%	5%
Three	44%	44%	43%	54%
Four	12%	12%	10%	9%
Five	9%	9%	9%	7%
Six	16%	16%	19%	12%
Virtual	0%	0%	0%	0%
Total	35,567	23,897	1,117	661

By Locale/Urbanicity

			COMP. SCI. OR ENGINEERING	
	PERCENT OF TOTAL	ENROLLED POST-SECONDARY (AT ANY TIME)	MAJORED IN A RELATED FIELD (EVER)	RECEIVED A RELATED CREDENTIAL
City	24%	25%	30%	34%
Suburb	26%	27%	26%	29%
Town	25%	24%	22%	18%
Rural	22%	21%	20%	17%
Virtual	3%	2%	2%	2%
Total	35,657	23,897	1,117	661

Distribution of the 2012-13 and 2017-18 Public High School Graduates (Selected Characteristics)



Map source: https://boardofed.idaho.gov/resources/map-of-education-regions-in-idaho/.

Postsecondary Entrants for the Progression Modeling

The second set of student cohorts for the progression modeling were those first-year (undergrad or graduate) or first year as transfer students in Idaho public institutions in 2018–19 (Summer term 2018 to Spring term 2019) and 2013–14 (Summer term 2013 to Spring term 2014).

These cohorts encompass the Idaho public high school graduates from Cohort 1, who enrolled in postsecondary within the first academic year after their high school graduation, as well as other students who entered the covered postsecondary institutions in that year:

		FIRST-TIME STUDENTS OTHER THAN IMMEDIATE COLLEGE-GOING IDAHO PUBLIC HIGH SCHOOL GRADUATES		IDAHO PUBLIC HIGH SCHOOL GRADUATES		
FIRST ENROLLED	TOTAL	STUDENTS WITH TERM-LEVEL DETAIL	LESS DETAIL (FOR CREDENTIAL AWARDS)	IMMEDIATE COLLEGE-GOING	OTHER GRADUATING CLASS	ID HSGs % OF ENROLLED POST-SECONDARY STUDENTS
AY 2013–2014	31,002	19,577		9,254	2,171	37%
AY 2018–2019	26,520	14,047	24,506	9,668	2,805	47%
Other Year	24,506					
Total Post-Sec. Students	82,028					

Notes: *Students categorized as First-time enrollees in AY 2013–14 or 2018–19 are those which were part of the defined cohorts for which term-level detail was received. A portion of additional students appear to have first enrolled in either of these two years, as indicated in the less detailed data about students who received a postsecondary credential in 2016–17 or 2021–22, which also included students who first enrolled in any year beginning 2001–02 ('Other Year').*

Related to the focus of this report:

- 30% of the entering students in 2013–14, and 38% in 2018–19, were Idaho public high school graduates who enrolled within the year after their high school graduation.
- 38% of the entering postsecondary students in 2013–14 and 2018–19 who ever declared a major in engineering or computer science/information services were graduates of Idaho public schools. The enrollment data indicates that the share of entering postsecondary students who ever declared a major in engineering or computer science/information services and were Idaho high school graduates increased from 29% in 2013–14 to 48% in 2018–19 (albeit this was in the context of fewer students who declared these majors, 2,236 and 1,825, respectively).
- 42% of the entering postsecondary students from 2013–14 and 2018–19 who received a credential in engineering or computer science/information services were graduates of Idaho public schools. Among the 2013–14 entering postsecondary students who had received a credential in engineering or computer science/information services (875), 47% were Idaho public high school graduates. (The data only cover credentials/degrees awarded through 2021–22, too few years elapsed to report completion outcomes for 2018–19 entering students). Postsecondary Graduates in 2016–17 and 2021–22

- The third set of cohorts for progression analysis were students who were awarded a postsecondary credential in 2016–17 or 2021–22 (any major, to allow some comparison of how non-engineering/computer science completers enter into the workforce).
- These data about credentials awarded in two academic years provide a snapshot of annual engineering or computer science/information services graduate production by Idaho public postsecondary institutions:

Postsecondary Graduates in 2016–17 and 2021–22

The third set of cohorts for progression analysis were students who were awarded a postsecondary credential in 2016–17 or 2021–22 (any major, to allow some comparison of how non-engineering/computer science completers enter into the workforce).

These data about credentials awarded in two academic years provide a snapshot of annual engineering or computer science/information services graduate production by Idaho public postsecondary institutions:

	2016–17				2021–22			
	ASSOCIATE'S	BACHELOR'S	MASTER'S	DOCTOR'S	ASSOCIATE'S	BACHELOR'S	MASTER'S	DOCTOR'S
COMPUTER AND INFORMATION SCIENCES AND SUPPORT SERVICES								
Idaho High School Graduate	35	62	0	0	97	103	4	0
Other Postsecondary Entrant	81	136	26	3	48	121	19	10
Total	116	198	26	3	145	224	23	10
ENGINEERING								
Idaho High School Graduate	14	139	5	0	13	25%	30%	34%
Other Postsecondary Entrant	9	27%	26%	29%	26%	27%	26%	29%
Total	23	24%	22%	18%	25%	24%	22%	18%
ENGINEERING/ENGINEERING-RELATED TECHNOLOGIES/TECHNICIANS								
Idaho High School Graduate	14	139	5	0	71	6	33	0
Other Postsecondary Entrant	9	361	122	9	20	215	94	30
Total	123	31	5	9	33	400	127	30
OTHER FIELD OF STUDY								
Idaho High School Graduate	1,078	1,927	106	–	1,976	2,710	369	5
Other Postsecondary Entrant	1,702	3,705	1388	79	1275	3649	1603	78
Total	2,780	5,632	1,494	79	3,251	6,359	1,972	83

In 2016–17, about 80% of credentials for computer/information sciences and support services or engineering and related technologies/technicians among previous Idaho public high school graduates in one of the target fields were to white non-Hispanic students, 12% were to students of another race or ethnicity (8% were unknown race or ethnicity). The proportions in 2021–22 were 77% white non-Hispanic, 18% other race or ethnicity and 5% unknown.

Employer Survey

Survey Administration and Response Follow Up

The survey was delivered in partnership with the Idaho Technology Council (ITC), with respondents solicited from the ITC membership, membership of the industry advisory boards of the state university's engineering and computer science programs, the Idaho chapter of American Council of Engineering Companies, and individual recommendations from the project's industry advisory team. The survey was distributed to 684 companies.

Email invitations to the survey were distributed by the Idaho Technology Council beginning January 5. The survey remained open for responses through March 15, 2023 while follow-up was conducted to get responses from as many and diverse respondents as possible. By March 15, 2023, surveys were initiated by 116 respondents, 44 of which were largely incomplete or were responses from more than one respondent from the same company, resulting in 72 unduplicated and mostly complete responses, which are tabulated below.

Results

Shown below are basic distributions of the responses received.

NOTE: *The tables show results among those who answered; numbers may vary based on survey completeness.*

Survey Introduction

Your cooperation with this 5 minute survey will help us estimate the magnitude of Idaho businesses' needs for employees with engineering and computer science postsecondary education. We will use the responses collected to supplement existing occupational demand estimates so that the state has up-to-date information about current and anticipated demand as they consider engineering and computer science education investments and programming.

Your responses will be kept secure and confidential and company names will not be shown in connection with any specific results.

If you need to consult records or another individual for the requested information, you can suspend and resume this survey form using the link provided.

1. **Company name**: Check here ☐ if you do not want your company name shown in the published list of responding companies.

2. **In what Idaho county is your company located?**: If you have employees in more than one location in Idaho, please indicate the county of the location where the majority of Idaho employees are employed.

COUNTY	NUMBER	PERCENT
Ada County	42	59%
Ada County, and other locations	6	8%
Bannock County	2	3%
Boise County	1	1%
Bonner County	1	1%
Bonneville County	2	3%
Canyon County	2	3%
Caribou County	1	1%
Gooding County	1	1%
Idaho County	1	1%
Kootenai County	1	1%
Latah County	5	7%
Nez Perce County	1	1%
Washington County (and Ada County)	1	1%
Multiple locations, including outside of Idaho	4	6%
TOTAL	**71**	**100%**

3. **Industry sector**: Please choose from these nationally standardized sectors. If your firm spans more than one industry sector, please select 'Other' and specify below

NAICS CODE	DESCRIPTION	ADDITIONAL INFORMATION (NOT PROVIDED BY ALL RESPONDENTS)	NUMBER	PERCENT
54	Professional, Scientific, and Technical Services	Analog Encryption for Storage and Communication. Department of Defense. Embedded Systems Design/Sales of Product. Engineering. Engineering and Construction. Geotechnical Engineering. Legal Technology. Structural Engineering Consultation. Technology Services, Solutions and Global Internet.	33	46%
33	Manufacturing	Aerospace. Mining and Manufacturing.	12	17%
51	Information	Data Analytics and Visualization. Software as a Service.	8	11%
45	Retail Trade	Also Wholesale, Transportation and Aviation Sectors.	3	4%
52	Finance and Insurance		2	4%
61	Educational Services		2	4%
62	Health Care and Social Assistance		2	3%
22	Utilities		1	1%
92	Public Administration		1	1%
81	Other Services, except Public Administration	IT and Related Technology.	1	1%
11	Agriculture, Forestry, Fishing and Hunting	Lumber.	1	1%
11	Other	Architecture and Engineering Consulting. Industrial, Mining, Food, Wood and Dairy, in combination. Legal. Utilities, Manufacturing, Professional Scientific and Technical Services, in combination.	4	6%
	Total		71	100%

4. **How many employees (total, engineering, and computer/IT) do you have assigned to your Idaho operations and do any percentage of these employees work remotely from outside of Idaho?** Please approximate as necessary. Include full-time, part-time, contract, and seasonal employees. If you are responding on behalf of more than one site doing business in Idaho, include employees across these multiple sites.

   Please use your best estimation of the "Engineering" and "Computer and Information Technology" employee categories. If you hire technicians in either category, please include them in your count. Software engineers should be counted under Engineering Employees. Examples of Computer and Information Technology Employees include but are not limited to: website developers, IT project managers, IT product owners, and tech support personnel.

	0	1–5	6–10	11–20	21–30	31–40	41–50	51–75	76–100	101–250	251–500	500+	CANNOT ESTIMATE, NOT APPLICABLE	EST. EMPLOYEES ACROSS RESPONDING COMPANIES*
Total Employees		7	6	5	7	5	3	1	2	11	7	16	1	13,434
Computer and Information Technology Employees	10	34	2	6	2	1	1	1	2	3	2	4	3	3,856
Engineering Employees	4	18	4	7	6	4	3	6	4	5	2	7	1	6,478

*** NOTE:** *Rather than asking for precise estimates, respondents were provided ranges in which to indicate their hiring demand. This table presents responses by range category. WICHE computed the estimated employees across responding companies from the mid value of the range. For example, for the range "41–50," low = 41, mid = 45, and high = 50.*

5. **Now, please anticipate the TOP 3 major fields of study you will most need among engineering and computer/IT employees to fulfill your hiring needs over the next year and up to 10 years into the future.** Include full-time, part-time, contract, and seasonal employees, and consider your need for employees to fill new positions as well as to replace turnover, retirements, etc. If you are responding on behalf of more than one site doing business in Idaho, include employees across these multiple sites.

			NUMBER OF RESPONSES			
	CIP Code	Program Title	#1	#3	#2	Chose as a Top 3 Major
Computer and Information Sciences and Support Services	11.07	Computer Science	9	3	1	13
	30.08	Mathematics and Computer Science	2	5	1	8
	11.0103	Information Technology	1	2	4	7
	11.09	Computer Systems Networking and Telecommunications	1	2	4	7
	15.1202	Computer Technology/Computer Systems Technology	3	1	2	6
	11	Computer And Information Sciences And Support Services	3	1	1	5
	11.0801	Web Page, Digital/Multimedia and Information Resources Design	0	1	3	4
	11.04	Information Science/Studies	1	1		2
	11.1001	Network and System Administration/Administrator	0	1	1	2
	11.0104	Informatics	1			1
	11.0804	Modeling, Virtual Environments and Simulation	0	1		1
	Number of Companies with Computer and Information Sciences and Support Services as One of the Top Hiriing Majors		**21**	**18**	**17**	**21**
Engineering	14.0801	Civil Engineering, General	16	4		20
	14.19	Mechanical Engineering	1	6	7	14
	15.0805	Mechanical Engineering/Mechanical Technology/Technician	5	6	2	13
	15.1304	Civil Drafting and Civil Engineering CAD/CADD	2	5	5	12
	14.47	Electrical and Computer Engineering	5	3	2	10
	15.0303	Electrical, Electronic and Communications Engineering Technology/Technician	0	5	3	8
	14.01	Engineering, General	2	3	1	6

	CIP Code	Program Title	#1	#3	#2	Chose as a Top 3 Major
			NUMBER OF RESPONSES			
Engineering	14.0805	Water Resources Engineering	0	4	2	6
	14.10	Electrical, Electronics and Communications Engineering	3	1	2	6
	14.99	Engineering, Other	3	1	2	6
	15.0613	Manufacturing Engineering Technology/Technician	2	1	3	6
	14.07	Chemical Engineering	1	2	2	5
	14.0901	Computer Engineering, General	4			4
	14.13	Engineering Science	1	1	2	4
	14.1801	Materials Engineering	0	1	3	4
	14.14	Environmental/Environmental Health Engineering	1		1	2
	14.27	Systems Engineering	0		2	2
	14.21	Mining and Mineral Engineering	0	1		1
	14.23	Nuclear Engineering	1			1
	Number of Companies with Engineering as One of the Top Hiring Majors		**47**	**44**	**3**	
		Unsure, cannot estimate*	1	1		

*** NOTE:** *One of the respondents, who could not classify the field of study, indicated demand for 'Intern' positions with a professional, scientific, and technical services establishment. The other respondent could not estimate demand but responded to other parts of the survey.*

6. **Please estimate for the #1, #2, and #3 education majors selected above: The preferred degree level for your firm's employees with that education major. Your recent ability to find employees with this education.**

NOTE: *The total number of responses for a given degree level may exceed the number of respondents, because companies could provide this information for up to three 'top' majors and therefore a given survey response may be reflected in up to three cells.*

6. **Please estimate for the #1, #2, and #3 education majors selected above: The preferred degree level for your firm's employees with that education major. Your recent ability to find employees with this education.**

NOTE: *The total number of responses for a given degree level may exceed the number of respondents, because companies could provide this information for up to three 'top' majors and therefore a given survey response may be reflected in up to three cells.*

			PREFERRED DEGREE LEVEL (NUMBER OF RESPONSES)				RECENT ABILITY TO FIND EMPLOYEES (NUMBER OF RESPONSES)		
	CIP Code	Program Title	Associate	Bachelor	Master or Higher*	Something Else or NA	Generally Able to Fill	Somewhat challenging to fill	Very challenging or unable to fill
Computer and Information Sciences and Support Services	11	Computer And Information Sciences And Support Services		3	2	1		3	
	11.0103	Information Technology	1	6			1	1	3
	11.0104	Informatics		1					1
	11.04	Information Science/Studies		2				1	
	11.07	Computer Science	1	10	1	1		7	2
	11.0801	Web Page, Digital/Multimedia and Information Resources Design		4			2	1	
	11.0804	Modeling, Virtual Environments and Simulation		1					
	11.09	Computer Systems Networking and Telecommunications	2	5				1	1
	11.1001	Network and System Administration/Administrator		2			1		
	15.1202	Computer Technology/Computer Systems Technology	1	3	2	1	1	2	1
	30.08	Mathematics and Computer Science		4	4			2	2

*** NOTE:** *Three respondents indicated that a Doctoral degree was the preferred degree level for employees with Computer Technology/Computer Systems Technology, Electrical and Computer Engineering, and Engineering (Other) degrees. And three indicated a Doctoral degree was preferred for employees with a Mathematics and Computer Science major.*

	CIP Code	Program Title	PREFERRED DEGREE LEVEL (NUMBER OF RESPONSES)				RECENT ABILITY TO FIND EMPLOYEES (NUMBER OF RESPONSES)		
			Associate	Bachelor	Master or Higher*	Something Else or NA	Generally Able to Fill	Somewhat challenging to fill	Very challenging or unable to fill
Engineering	14.01	Engineering, General	1	4	1			1	3
Engineering	14.07	Chemical Engineering		5			1		2
Engineering	14.0801	Civil Engineering, General		12	8		2	6	7
Engineering	14.0805	Water Resources Engineering		3	3				4
Engineering	14.0901	Computer Engineering, General		4		1	1	2	
Engineering	14.10	Electrical, Electronics and Communications Engineering		4	2		1	4	
Engineering	14.13	Engineering Science	1	3				3	
Engineering	14.14	Environmental/Environmental Health Engineering		1	1				
Engineering	14.1801	Materials Engineering			4			2	
Engineering	14.19	Mechanical Engineering		10	4		5	3	1
Engineering	14.21	Mining and Mineral Engineering		1				1	
Engineering	14.23	Nuclear Engineering			1			1	
Engineering	14.27	Systems Engineering	1	1				2	
Engineering	14.47	Electrical and Computer Engineering	2	4	5		1	1	2
Engineering	14.99	Engineering, Other		3	3			1	3
Engineering	15.0303	Electrical, Electronic and Communications Engineering Technology/Technician		6		2	2	4	
Engineering	15.0613	Manufacturing Engineering Technology/Technician	1	5				2	
Engineering	15.0805	Mechanical Engineering/Mechanical Technology/Technician	2	10		1	3	4	1
Engineering	15.1304	Civil Drafting and Civil Engineering CAD/CADD	5	4	2	1		3	5
		Unsure, cannot estimate top majors		2					1

7. **About how many employees with that education do you expect to hire in the next 12 months, between now and 5 years from now, and between now and 10 years from now (approximate as necessary).**

NOTE: *Rather than asking for precision estimates, respondents were provided ranges in which to indicate their hiring demand: 0, 1–5, 6–10, 11–20, 21–30, 31–40, 41–50, 51–75, 76–100, 101–250, 251–500, and more than 500. For feasibility, this table summarizes responses by broader categories. WICHE computed the estimated Jobs from the mid value of the range. For example, for the range "'1–50," low =41, mid = 45, and high = 50. Also, the total number of responses for a given program may exceed the number of respondents, because companies could provide this information for up to three 'top' majors and therefore a given survey response may be reflected in up to three cells.*

a. In the next 12 months

			PROJECTED NUMBER OF EMPLOYEES			PERCENT OF ESTIMATED JOBS			
	CIP Code	Program Title	1–50	51–100	100 or more	Associate	Bachelor	Master or PhD	ESTIMATED JOBS
Computer and Information Sciences and Support Services	11.0103	Information Technology	6		1	1%	99%		541
	11.09	Computer Systems Networking and Telecommunications	5		1	94%	6%		533
	11.07	Computer Science	12	1		1%	79%	7%	202
	30.08	Mathematics and Computer Science	6	1			92%	8%	118
	11.0801	Web Page, Digital/Multimedia and Information Resources Design	3	1			100%		97
	11	Computer And Information Sciences And Support Services	5				51%	49%	37
	15.1202	Computer Technology/Computer Systems Technology	6			9%	40%	9%	35
	11.0804	Modeling, Virtual Environments and Simulation	1				100%		8
	11.1001	Network and System Administration/Administrator	2				100%		6
	11.04	Information Science/Studies	2				100%		6
	11.0104	Informatics	1				100%		3
	COMPUTER AND INFORMATION SERVICES AND SUPPORT SERVICES								**1,586**

			PROJECTED NUMBER OF EMPLOYEES			PERCENT OF ESTIMATED JOBS			
	CIP Code	Program Title	1–50	51–100	100 or more	Associate	Bachelor	Master or PhD	ESTIMATED JOBS
Engineering	15.0303	Electrical, Electronic and Communications Engineering Technology/Technician	7		1		98%		396
	15.0613	Manufacturing Engineering Technology/Technician	4	1	1	1%	99%		280
	15.0805	Mechanical Engineering/Mechanical Technology/Technician	11		1	2%	97%		260
	14.0801	Civil Engineering, General	19	1			75%	25%	210
	14.47	Electrical and Computer Engineering	8		1	88%	8%	4%	209
	14.1801	Materials Engineering	3	1				100%	119
	14.10	Electrical, Electronics and Communications Engineering	5	1			95%	5%	115
	14.19	Mechanical Engineering	14				84%	16%	74
	15.1304	Civil Drafting and Civil Engineering CAD/CADD	11			24%	58%	12%	50
	14.23	Nuclear Engineering	1					100%	45
	14.01	Engineering, General	6			20%	73%	8%	40
	14.0901	Computer Engineering, General	3				74%		31
	14.27	Systems Engineering	2			11%	89%		28
	14.0805	Water Resources Engineering	5				22%	78%	27
	14.99	Engineering, Other	6				61%	39%	23
	14.07	Chemical Engineering	5				100%		20
	14.13	Engineering Science	4			18%	82%		17
	14.14	Environmental/Environmental Health Engineering	2				50%	50%	6
	14.21	Mining and Mineral Engineering	1				100%		3
	ENGINEERING								**1,953**
		Unsure, cannot estimate	1				100%		3

b. Between now and 5 years from now, and between now and 10 years from now:

			5 YEARS FROM NOW NUMBER RESPONDING BY RANGE AND TOTAL ESTIMATED				10 YEARS FROM NOW* NUMBER RESPONDING BY RANGE AND TOTAL ESTIMATED			
	CIP Code	Program Title	1–50	51–100	100 or more	Estimated Jobs	1–50	51–100	100 or more	Estimated Jobs
Computer and Information Sciences and Support Services	11.0103	Information Technology	5	1	1	643	5		2	762
	11.09	Computer Systems Networking and Telecommunications	4	1	1	640	3	2	1	720
	11.07	Computer Science	10	1	1	475	7	1	3	1188
	30.08	Mathematics and Computer Science	6	1		110	4	1	1	319
	11.0801	Web Page, Digital/Multimedia and Information Resources Design	3			19	3			38
	11	Computer And Information Sciences And Support Services	5			151	2	2	1	374
	15.1202	Computer Technology/Computer Systems Technology	6			89	4			120
	11.0804	Modeling, Virtual Environments and Simulation	1			45			1	175
	11.1001	Network and System Administration/Administrator	2			11	1			3
	11.04	Information Science/Studies	2			18	2			23
	11.0104	Informatics	1			15				0
	COMPUTER AND INFORMATION SERVICES AND SUPPORT SERVICES					**2,216**				**3,722**

*** NOTE:** *WICHE heard that it is difficult to estimate demand at 5 years and particularly 10 years out, and a diminished number of responses are reflected in the longer timeframes. The estimate demand was distributed similarly across degree levels as at 12 months, so for feasibility, it is not repeated in this table.*

			5 YEARS FROM NOW NUMBER RESPONDING BY RANGE AND TOTAL ESTIMATED				10 YEARS FROM NOW* NUMBER RESPONDING BY RANGE AND TOTAL ESTIMATED			
	CIP Code	Program Title	1–50	51–100	100 or more	Estimated Jobs	1–50	51–100	100 or more	Estimated Jobs
Engineering	15.0303	Electrical, Electronic and Communications Engineering Technology/Technician	7		1	413	7		1	445
	15.0613	Manufacturing Engineering Technology/Technician	4		1	545	3	1	1	598
	15.0805	Mechanical Engineering/Mechanical Technology/Technician	11	1		202	9	2		232
	14.0801	Civil Engineering, General	19		1	579	13	4	1	916
	14.47	Electrical and Computer Engineering	9		1	594	6	1	1	651
	14.1801	Materials Engineering	2	1	1	582	2		1	512
	14.10	Electrical, Electronics and Communications Engineering	4	1	1	502	3	1	2	795
	14.19	Mechanical Engineering	13	1		165	11	1		234
	15.1304	Civil Drafting and Civil Engineering CAD/CADD	11			109	10			130
	14.23	Nuclear Engineering		1		88				0
	14.01	Engineering, General	5		1	244	5			103
	14.0901	Computer Engineering, General	4			86	1	1	1	266
	14.27	Systems Engineering	1			3	1			8
	14.0805	Water Resources Engineering	5			72	4	1		129
	14.99	Engineering, Other	6			81	4			98
	14.07	Chemical Engineering	5			52	4	1		117
	14.13	Engineering Science	4			44	3			68
	14.14	Environmental/Environmental Health Engineering	1			8	1			8
	14.21	Mining and Mineral Engineering	1			8	1			15
	Engineering					**4,377**				**5,325**
	14.21	Unsure, cannot estimate	2			6	2			11

8. **Any additional information about your anticipated engineering and/or computer/ information technology hiring needs you would like to share.**

Respondents with (primarily) Computer and Information Sciences and Support Services demand:

- Data Management, Data Integration, Data Security
- Had multiple job openings for 2 years now and unable to fill. Lack of interested candidates and lack of qualified candidates.
- Hire people for non-technical positions in customer success with some background in software (ex. bootcamp) or OTJ in cybersecurity (ex. from National Guard experience) that they can over time train up.
- We need all types of knowledge workers.
- Most of our positions are required to work on-site at one of the National Labs or in Washington DC which can make hiring more challenging.
- Need to include analytics, business intelligence and artificial intelligence/machine learning.
- The above are approximate numbers for our Idaho-based business unit. My personal hiring needs skew more strongly towards highly educated research professionals (small number of PhDs or Masters with demonstrable research experience)
- The most important skill is not math and the process, it is all of that in addition to creativity, critical thinking, and communication. We need people who are coachable.
- We are struggling to hire in the Idaho market. Most new hires are either in other states or outside the country. We've been investing in establishing development centers in other cities to find talent.
- We have found that we have to settle for people outside of Idaho and people without degrees, but with the right experience, in order to fill our job openings.
- We hire mainly from out of state. We actively recruit outside of Idaho.
- We're finding that computer programming, UI/UX, product management, and other 'build software application' positions are generally very hard to find in Idaho and much easier to find in other areas so we hire remote. We also find that local code schools are generally preparing employees better for real world needs better than the universities in this sector.
- We've hired many persons remotely to expand our options and diversity. Even locally living persons prefer to work remote so we are comfortable with remote workers.

Respondents with (primarily) Engineering demand

- Any type of engineer, plus another specialty do not wish to disclose; demand would really increase if a big project they're working on happens; would really shift these numbers
- CAD technicians are more difficult to locate/hire than engineers.

- I'm a Boise State Alumni and I will NOT hire anyone without a direct referral from that college. I'm personally utterly embarrassed by the lack of basic embedded systems knowledge from our local university. The level of industry targeted knowledge is beyond lack luster. Every - single - one of my interviews with a BSU alumni that has applied through LinkedIn or any other medium that wasn't directly selected by me has turned into me educating the interviewee rather than them answering the most basic of questions. i.e. "show me a circuit that will allow a microcontroller to read the resistance of a potentiometer". Seriously BSU, please update your program. I'm tired of recommending employers as well as students go elsewhere - in fact - anywhere else (CWI, U of I, etc.).
- More advanced analytic background is critically important going forward.
- These numbers cover anticipated hiring for three current locations, but are not inclusive of all our technical hiring. As an engineering and environmental firm, all our hires outside of administrative, financial, and support staff have a technical background.
- We have more problem finding highly knowledgeable analog engineers.
- Will hire at Bachelor's level, but prefer masters - also a big shortage at associate's degree level for surveyors and CAD

9. **Are there any licenses, certificates, industry certifications, or other credentials outside of the postsecondary degree types listed above that are critical for your firm's employees to hold?**

Respondents with (primarily) Computer and Information Sciences and Support Services demand:

- A variety of certifications in IT and computer networking, as well as cloud computing certifications (can't recall the names offhand, but there are several cloud certifications from Microsoft, Google, and AWS that I think would be immensely useful for us).
- Actual portfolio of Project results. Most Computer science can be self taught from online resources and is best learned when applied.
- AWS certified cloud practitioner Certified cloud security professional (CCSP) Certified data privacy solutions engineer (CDPSE) Certified data professional (CDP) Certified ethical hacker (CEH) Certified information security manager (CISM) Certified information systems security professional (CISSP) Cisco certified internetwork expert (CCIE) Cisco certified network professional (CCNP) CompTIA (A+, Cloud+, Security+) Microsoft Certified Azure Solutions Architect Microsoft certified solutions associate/ expert (MCSA/MCSE) Information technology infrastructure library (ITIL) Oracle database and MySQL administration certifications Project management professional (PMP) Salesforce certified development lifecycle and deployment designer
- AWS credentials are valuable. Web technology certificates are also good.
- CISSP (need 5 years of experience to take the test), Security+, Offensive Security Certified Professional (OSCP)
- Cloud platform certifications (AWS, GCP) are desirable but not required for all positions.

- Depends on the position - Safety certifications, health physics, etc. as needed.
- For more experienced positions additional credentials might help, but we don't have any requirements today.
- I am less concerned about 4 year degrees and more concerned about people who know how to write code. The code camp schools are leaving plenty to be desired in most candidates.
- Network Certifications, IT Certifications, Sales, Business and SAP ERP certifications
- There are a lot of options and pathways, but nothing that is critical.
- We have hired engineers that have been through bootcamps and some with four year degrees. The education that they receive is so behind that we've found, more often than not, we're better off to hire those that dropped out and are self-taught.
- We're finding that real world experience and/or code schools are generally producing employees with skill sets closer to what we need for our software application positions. These don't typically correspond with licenses, certificates, etc.

Respondents with (primarily) Engineering demand:

- All of our engineering/geology staff are required to pass the Fundamentals of Engineering/ Fundamentals of Geology to obtain their Engineer-in-training (E.I.T.) or Geologist-in-training (G.I.T.) certification, AND then pass their respective professional license exams to become licensed as a Professional Engineer (P.E.) or Professional Geologist (P.G.).
- All staff need certifications, and some need to attain professional engineering licensure
- Construction inspector certifications, HAZWOPER, OSHA 10-hour, CADD and BIM certificates, Civil 3D skills
- Construction testing certifications, WAQCT
- EI, PE
- Fundamentals of Engineering (FE), Professional Engineer (PE), Structural Engineer (SE)
- Fundamentals of Engineering exam. PE exam and licensure.
- HAZWOPER, WAQTC Certifications
- Licenses: Professional Engineer, Professional Land Surveyor, PTOE, AICP

- Multiple cybersecurity specialized certifications.
- None required, professional licenses are encouraged.
- P.E., ENV SP, LEED
- PE is great but not necessary
- PE license for Civil Engineers
- PE licenses for engineers
- PE seal
- PE, various IT Certifications
- PE's, EIT's, structural Engineering
- PMP, PE
- Professional Engineer
- Professional Engineer (PE).
- Professional Engineer License (PE)
- Professional Engineer, Professional Geologist.
- Professional Engineer; IT and cyber security credentials;
- Professional Engineering license preferred but not critical/required.
- Professional Engineers (PE), Professional/Registered Geologist (P/RG), Licensed Engineer Geologist (LEG)
- Tech certs of all kinds
- United States Patent and Trademark Office registration (strong preference); state bar registration (strong preference); J.D. degree (strong preference)
- We seek engineers with experimental graduate research experience

10. **What role do Idaho colleges and universities—or other sources—play in producing the engineering and computer/information technology employees you need?**

		NUMBER					PERCENT				
		Strongly Agree	Somewhat Agree	No Opinion or N/A	Somewhat Disagree	Strongly Disagree	Strongly Agree	Somewhat Agree	No Opinion or N/A	Somewhat Disagree	Strongly Disagree
Computer and Information Sciences and Support Services	We prefer to hire locally and/or have employees on premises	8	10	1	2	1	36%	45%	5%	9%	5%
	Hiring graduates from Idaho colleges and universities is important to us	8	9	4	1	0	36%	41%	18%	5%	0%
	There are sufficient applicants from Idaho universities for our needs	0	1	3	10	8	0%	5%	14%	45%	36%
	There are sufficient applicants from Idaho community colleges for our needs	0	0	10	3	9	0%	0%	45%	14%	41%
	There are sufficient applicants from non-college training programs for our needs	2	3	11	3	3	9%	14%	50%	14%	14%
	We rely on training provided by Idaho colleges or universities to upskill our current workforce	1	8	4	5	4	5%	36%	18%	23%	18%
	Colleges or universities outside the state provide skillsets that Idaho colleges and universities do not	5	6	3	6	2	23%	27%	14%	27%	9%
	We have specific strategic targets that are hard to fulfill from Idaho colleges or universities (e.g., grant requirements, diversity goals, etc.)	4	2	8	5	3	18%	9%	36%	23%	14%
	Other factors are more important than where the employee originates (please specify)	11	6	4	0	0	52%	29%	19%	0%	0%

		NUMBER					PERCENT				
		Strongly Agree	Somewhat Agree	No Opinion or N/A	Somewhat Disagree	Strongly Disagree	Strongly Agree	Somewhat Agree	No Opinion or N/A	Somewhat Disagree	Strongly Disagree
Engineering	We prefer to hire locally and/or have employees on premises	30	12	2	1	0	67%	27%	4%	2%	0%
	Hiring graduates from Idaho colleges and universities is important to us	26	11	4	2	2	58%	24%	9%	4%	4%
	There are sufficient applicants from Idaho universities for our needs	1	10	5	16	13	2%	22%	11%	36%	29%
	There are sufficient applicants from Idaho community colleges for our needs	0	5	12	14	14	0%	11%	27%	31%	31%
	There are sufficient applicants from non-college training programs for our needs	0	8	18	11	8	0%	18%	40%	24%	18%
	We rely on training provided by Idaho colleges or universities to upskill our current workforce	8	12	8	9	8	18%	27%	18%	20%	18%
	Colleges or universities outside the state provide skillsets that Idaho colleges and universities do not	7	15	12	8	3	16%	33%	27%	18%	7%
	We have specific strategic targets that are hard to fulfill from Idaho colleges or universities (e.g., grant requirements, diversity goals, etc.)	7	9	17	9	3	16%	20%	38%	20%	7%
	Other factors are more important than where the employee originates (please specify)	19	9	13	2	0	44%	21%	30%	5%	0%

11. **Other information:**

Respondents with (primarily) Computer and Information Sciences and Support Services demand:

- Ability to deliver results, innovation, and demonstrated initiative.
- Culture, acumen, knowledge
- Even local employees often work remote. Being humble, hungry, and people smart far outweighs location.
- I grew up in Idaho and attended an Idaho college for a short time. However, the education was not at all what I needed to be successful in my field. It fell very short. I would be surprised to find a candidate from an Idaho university that would meet the needs of my organization.
- Qualifications: areas of study and practical experience from projects or (preferably) internships.
- SAP has an Alliances University offering for free. Dozens of US universities leverage this program to help certify SAP resources. In short, the business community is screaming for this need. Idaho universities can get content for free and quickly generate Business Certification Revenue.
- Skills are the most critical thing for hiring, they assess these during their interview process
- Skillset matters most.
- total compensation requirements, skill sets, and experience are still the most important factors for hiring.
- Training and experience are more important than origination. For my teams' positions I would rather hire a strong researcher from an out-of-state institution than an Idaho-trained individual with no research experience.
- We are an early stage startup company so assessing these questions is somewhat hard at this stage.
- We have non-college training candidates but very few of them have the requisite skills.
- We target employees who are capable in data management (set theory, Structured Query Language - SQL, Dimensional Data Modeling, Data Vault Data Modeling). While Idaho's employment laws are often superior from an employer perspective, we look elsewhere because these skills are not produced from standard ID universities and colleges.
- We're most interested in qualifications. We like the idea of hiring software engineers with four-year degrees, but we have not been able to find them from our recruiting at BYU-Idaho and Idaho State.

Respondents with (primarily) Engineering demand:

- Applicable skills in: Education Experience
- Because we cannot find/hire sufficient students from Idaho Colleges and Universities to meet our current staffing needs, we also recruit from other schools in Utah and Washington.

- Best qualified individual for the need. U of I graduates routinely meet that need and in many areas excel over graduates from other universities.
- Candidates are evaluated on their skills and potential to fill the need of the specific position, regardless of where they are from or which university they attended.
- Credentials, experience, and cultural fit are important factors regardless of where the employee originates.
- For the specific skills like communications circuit engineering (analog transmitter/mixer/modulator) work at high frequencies hiring someone with experience is safer.
- If an employee originates from outside the state but is very qualified and meets/exceeds our expectations, that's more important than location.
- If we can find people with a seismic background that is very important, and there is little in any Idaho curriculum to support that (U of I does some, BSU used to have a structural dynamics course, but it has not run for some time).
- ISU could, or should, provide engineering focus on PE end goal for graduates.
- It is sometimes difficult to draw people to north Idaho, so drawing people who are local is helpful for retention. But the biggest factor is really just getting the right individuals and team fit, which can be from most anywhere. Aerospace engineering is a skillset that Idaho colleges don't offer, so that would be useful -- but mechanical and electrical engineering degrees are usually acceptable.
- My company's main office is outside of Idaho. Some employees work remotely FROM Idaho. On-site preference is for non-Idaho employees.
- Need to be willing to live in a small town
- Other factors- education, skillset, and diversity are more important than where the employee originates
- Passion about the field and baseline embedded systems knowledge.
- Previous experience is typically more important than where the degree comes from. Idaho degrees are not specifically a hiring criteria
- Quality of candidate
- Soft and team/collaborative skills, as well as effective communication are critically important.
- The graduate research programs in Idaho do not produce the skillsets or experience we require in our advanced engineering business. Consequently, our senior hires have had to come from out of state. We obviously can preference origin location over the requisite skills for our positions.
- Their skillset and availability.
- Upper bound of estimated hires is impossible to say – we will hire engineers wherever. People can be anywhere now – could theoretically hire as many as came out of programs.

- We hire all qualified candidates no matter where they went to school but prefer ones from Idaho.
- We like the small town background for work ethic and hands-on experience. Workers from larger cities seem to have slightly better education.
- Where they are from is not important at all. proximity to clients/office is more of a factor in choosing to hire, as is CV
- Work ethic, experience & previous training

NCHEMS Student Flow Model

Project/Model Description

NCHEMS was contracted to modify their base Student Pipeline Model to accommodate data provided by the Idaho Office of the State Board of Education to track the progress of Idaho students from 9th grade through college completion and to allow users to adjust performance at selected points along the pipeline to ascertain the overall impact on postsecondary enrollments and completions for selected program areas (computer science, engineering, and engineering tech) out to the year 2030.

User Note

NCHEMS Base Student Flow Model strictly utilizes publicly available data and publications to generate the dashboard metrics and background calculations for the model. Sources of data include the National Center for Education Statistics (NCES), the NCES Integrated Postsecondary Education Data System (IPEDS), Western Interstate Commission for Higher Education (WICHE) secondary enrollment and high school graduate projections, Census Bureau population estimates, and the Census Bureau's American Community Survey (ACS). For this project, the Idaho Office of the State Board of Education was able to provide program-level enrollment and completions data by sector (public 4-year, public 2-year) to help inform the model to produce program-level enrollments and completions. Although the model inputs and outputs enrollment and completions numbers in precision, there is inherently error propagating through the model due to imperfect data and missing data elements. Differences in the multiple data sets used within the model create some error as does lack of detail at the institution level and on the various types of students moving through the pipeline. Users should focus on the magnitude of change and directional patterns observed in enrollment and completions distributions when drawing conclusions.

College Participation Metrics (User adjustable within the model)

High School Graduation Rates

Sources: National Center for Education Statistics (NCES) Digest of Education Statistics, public high school 4-year adjusted cohort graduation rate (ACGR). Idaho Office of the State Board of Education, 9th grade and high school graduate numbers 2010–11 through 2021–22 (projections calculated by WICHE).

Description: The adjusted cohort graduation rate (ACGR) is the percentage of public high school freshmen who graduate with a regular diploma within 4 years of starting 9th grade. Students who are entering 9th grade for the first time form a cohort for the graduating class. This cohort is "adjusted" by adding any students who subsequently transfer into the cohort and subtracting any students who subsequently transfer out, emigrate to another country, or die. Additional high school graduates entering postsecondary education 2022–23 through 2029–30 are calculated using 9th grade and high school graduate projections.

In-State College-going Rates Directly Out of High School

Sources: NCES, IPEDS Fall Residency and Migration Surveys for Fall 2016, 2018, and 2020 (mandatory reporting in even years only). Western Interstate Commission for Higher Education, Knocking at the College Door: Projections of High School Graduates, 2020. https://knocking.wiche.edu/data/knocking-10th-data/. High school graduates for academic years 2015–16, 2017–18, and 2019–20.

Description: In-State Fall first-time students directly out of high school (within the past year) as a percent of recent high school graduates (the previous spring), 3-year weighted average 2016, 2018, and 2020.

Out-of-State College-Going Undergraduates Directly Out of High School

Sources: NCES, IPEDS Fall Residency and Migration Surveys for Fall 2016, 2018, and 2020 (mandatory reporting in even years only).

Description: Number of out-of-state first-time undergraduates directly from high school attending Idaho Title IV institutions.

First-Time Participation Rate of 20–44 Year Olds

Sources: NCES, IPEDS Fall Residency and Migration Surveys for Fall 2016, 2018, and 2020 (mandatory reporting in even years only). U.S. Census Bureau July 1 Population Estimates by age, 2016, 2018, and 2020.

Description: Fall first-time students not directly out of high school as a percent of 20–44 year-olds (3-year weighted average 2016, 2018, and 2020).

College Retention and Progression (User adjustable within the model)

Postsecondary Progression Rates by sector, student type, program, and postsecondary year of enrollment

Sources: Idaho Office of the State Board of Education, year-to-year progression of undergraduate students by student type, sector, program, and postsecondary year, 2016–17 through 2021–22 (overall average figures for this period calculated by NCHEMS). NCES, IPEDS fall 2020 enrollment files (fall 2020 retention rates by sector). NCES, IPEDS 2018–19, 2019–20, and 2020–21 instructional activity files. NCES, IPEDS 2018–19, 2019–20, and 2020–21 Completions files.

Description, Public 4-year: Average enrollment and progression rates for first-to-second, second-to-third, and third-to-fourth year undergraduate enrollment for selected programs (computer science, engineering, and engineering tech). These three progression years are used to model overall enrollment trends at public 4-year institutions. IPEDS awards, enrollment, and first-to-second year retention for public 4-year institutions were used to inform an estimated split of the Idaho progression data into public research and public comprehensive institutions.

Description, Public 2-year: Average enrollment and progression rates for first-to-second and second-to-third year undergraduate enrollment for selected programs (computer science, engineering, and engineering tech). These two progression years are used to model overall enrollment trends at public 2-year institutions.

Description, Private Institutions: IPEDS enrollment, completions, and retention were used to compare with public 4-year institutions to estimate progression of undergraduate students for first-to-second, second-to-third, and third-to-fourth year for selected programs (computer science, engineering, and engineering tech). These three progression years are used to estimate overall enrollment trends at private institutions.

College Completion (User adjustable within the model)

Undergraduate degrees and certificates produced per 100 FTEs

Sources: Idaho Office of the State Board of Education, completions and FTE enrollment by program and postsecondary year, 2016–17 through 2021–22 (overall average figures for this period calculated by NCHEMS). NCES, IPEDS 2017–18, 2018–19, and 2019–20 instructional activity files (total FTE enrollment by sector). NCES, IPEDS 2017–18, 2018–19, and 2019–20 completions files (total undergraduate awards by sector).

Description: Undergraduate credentials (certificates of at least 12 weeks in length, associates, and bachelor's) awarded per 100 full-time equivalent undergraduates by sector and program (computer science, engineering, and engineering tech). Idaho figures by sector and program are an average for 2016–17 through 2021–22. IPEDS figures for sector totals are a 3-year weighted average for 2017–18, 2018–19, and 2019–20.

ENDNOTES

1 The relatively close relationship between bachelor (and above) degree holders in engineering and computer-related fields and employer hiring demand for these types of roles was less clear for engineering technologists (who might be hired at the bachelor's or associates level, or trained on the job), therefore, these data are not presented in the executive summary.

2 Bureau of Labor Statistics. (2022, September 8). *Occupational outlook handbook: Architecture and engineering occupations.* U.S. Department of Labor. https://www.bls.gov/ooh/architecture-and-engineering/home.htm

3 WICHE analysis of IPEDS data & data provided by the Idaho State Board of Education. The research presented here utilizes SLDS Data from the Idaho State Board of Education (SBOE) and the Idaho State Department of Education (SDE). Any errors are attributable to WICHE.

4 Krebs, B., McHugh, C., & Mehl, A. (2023, January). *Educated in Idaho, employed in Idaho.* Idaho State Board of Education. https://boardofed.idaho.gov/resources/educated-in-idaho-employed-in-idaho/

5 Bureau of Labor Statistics. (2022, May). Occupational employment and wage statistics. U.S. Department of Labor. https://www.bls.gov/oes/tables.htm

6 ACEC Research Institute. (2023, May). *Engineering business sentiment 2023 Q2.* American Council of Engineering Companies. https://programs.acec.org/impact-report-21

7 While WICHE generally prefers precision in using defined terms, there are substantial gray areas in usage on the ground, so further analyses will provide substantial analysis of this point. For additional context, please see National Center for Education Statistics. (n.d.). *The classification of instructional programs: Detail for CIP code 11, computer and information sciences and support services.* U.S. Department of Education Institute of Educational Sciences. https://nces.ed.gov/ipeds/cipcode/cipdetail.aspx?y=55&cipid=88073.

8 Bureau of Labor Statistics. (2022, September 8). *Occupational outlook handbook: Architecture and engineering occupations.* U.S. Department of Labor. https://www.bls.gov/ooh/architecture-and-engineering/home.htm.

9 Within the Bureau of Labor Statistics' *Occupational employment and wage statistics* tables, "Computer" occupations include all occupations within SOC Code 15-1200 "Computer Occupations" (due to changes to the SOC Classification system between 2010 and 2018. Computer Occupations were defined as 15-1100 from 2010 to 2017 and use 15-1200 beginning in 2018. These data generally reflect the same "bucket" of occupations although specific detailed occupations were added and deleted over this time period as well as 11-3021 "Computer and Information Systems Managers" within 11-3000 "Operations Specialties Managers." According to the BLS occupational profiles, entry-level work in each of these fields typically requires a bachelor's degree. Bureau of Labor Statistics. (2022, May). Occupational employment and wage statistics. U.S. Department of Labor. https://www.bls.gov/oes/tables.htm

10 Bureau of Labor Statistics. (2022, May). *Occupational employment and wage statistics.* U.S. Department of Labor. https://www.bls.gov/oes/tables.htm

11 Bureau of Labor Statistics. (2023). *Occupational employment and wage data, May 2022.* Idaho Department of Labor. https://lmi.idaho.gov/data-tools/oews/

12 Bureau of Labor Statistics. (2023). *Occupational employment and wage data, May 2022:* Table 1.05. Idaho Department of Labor. https://lmi.idaho.gov/data-tools/oews/

13 Idaho Department of Commerce. *Key Industries.* https://commerce.idaho.gov/site-selection/key-industries/

14 Becker, M., Pace, L., & Spolsdoff, J. (2022, October). Utah's engineering and computer science workforce: Higher education and economic trends. Kem C. Gardner Policy Institute, University of Utah. https://gardner.utah.edu/wp-content/uploads/ECS-Report-Oct2022.pdf

15 National Center for Education Statistics. (n.d.). The classification of instructional programs: Detail for CIP code 11, computer and information sciences and support services. U.S. Department of Education Institute of Educational Sciences. https://nces.ed.gov/ipeds/cipcode/cipdetail.aspx?y=55&cipid=88073

16 National Center for Education Statistics. (n.d.). The classification of instructional programs: Detail for CIP code 14, engineering. U.S. Department of Education Institute of Educational Sciences. https://nces.ed.gov/ipeds/cipcode/cipdetail.aspx?y=55&cipid=88196

17 National Center for Education Statistics. (n.d.). *The classification of instructional programs: Detail for CIP code 15, engineering technologies/technicians.* U.S. Department of Education Institute of Educational Sciences. https://nces.ed.gov/ipeds/cipcode/cipdetail.aspx?y=55&cipid=88196

18 The relatively close relationship between bachelor (and above) degree holders in engineering and computer-related fields and employer hiring demand for these types of roles was less clear for engineering technologists (who might be hired at the bachelor's or associates level, or trained on the job), therefore, these data are not presented in the executive summary.

19 National Center for Education Statistics. (2023, May). *Postsecondary education: Undergraduate enrollment. U.S. Department of Education Institute of Educational Sciences.* https://nces.ed.gov/programs/coe/indicator/cha/undergrad-enrollment

20 Idaho State Board of Education. *College-Going Dashboard.* https://dashboard.boardofed.idaho.gov/CollegeGoingDashboard.html

21 National Center for Education Statistics. (2023, May). *Immediate college-going rate of high school completers.* U.S. Department of Education Institute of Educational Sciences. https://nces.ed.gov/programs/coe/indicator/cpa/immediate-college-enrollment-rate

22 Western Interstate Commission for Higher Education. (2020, December). *Knocking at the college door: Projections of U.S. high school graduates.* WICHE. https://knocking.wiche.edu/
National Center for Education Statistics. (n.d.). *Digest of education statistics.* U.S. Department of Education Institute of Educational Sciences. https://nces.ed.gov/programs/digest/d17/tables/dt17_304.10.asp)
Utah System of Higher Education. (2023). *Headcount.* https://ushe.edu/institutional-data-resources-headcount/

23 WICHE cleaned the data using transparent and appropriate processes. For specific detail on the approaches used, please see the appendix. Because of these cleaning approaches, data presented here may differ slightly from other sources and reports.

24 Department of Education. (2022.) *Understanding your student's scores on the i=Idaho standards achievement test in English language arts/literacy and mathematics.* State of Idaho. https://www.sde.idaho.gov/assessment/files/shared/isat/Understanding-Your-Student-Scores-ISAT-ELA-Math.pdf

25 Research on the topic is voluminous. See for example: Lent, Robert W., Matthew J. Miller, Paige E. Smith, Bevlee A. Watford, Robert H. Lim, and Kayi Hui. "Social cognitive predictors of academic persistence and performance in engineering: Applicability across gender and race/ethnicity." *Journal of Vocational Behavior* 94 (2016): 79-88; and Lee, Hang-Shim, Lisa Y. Flores, Rachel L. Navarro, and Marlen Kanagui-Muñoz. "A longitudinal test of social cognitive career theory's academic persistence model among Latino/a and White men and women engineering students." *Journal of Vocational Behavior* 88 (2015): 95-103.

26 Bureau of Labor Statistics. (2022, September 8). *Occupational outlook handbook: Architecture and engineering occupations.* U.S. Department of Labor. https://www.bls.gov/ooh/architecture-and-engineering/home.htm

27 This conclusion is drawn from WICHE's analysis of IPEDS data & data provided by the Idaho State Board of Education.

28 Krebs, B., McHugh, C., & Mehl, A. (2023, January). *Educated in Idaho, employed in Idaho.* Idaho State Board of Education. https://boardofed.idaho.gov/resources/educated-in-idaho-employed-in-idaho/

29 Krebs, B., McHugh, C., & Mehl, A. (2023, January). *Educated in Idaho, employed in Idaho.* Idaho State Board of Education. https://boardofed.idaho.gov/resources/educated-in-idaho-employed-in-idaho/

30 Krebs, B., McHugh, C., & Mehl, A. (2023, January). *Educated in Idaho, employed in Idaho.* Idaho State Board of Education. https://boardofed.idaho.gov/resources/educated-in-idaho-employed-in-idaho/

31 Research on the topic is voluminous. See for example: Lent, Robert W., Matthew J. Miller, Paige E. Smith, Bevlee A. Watford, Robert H. Lim, and Kayi Hui. "Social cognitive predictors of academic persistence and performance in engineering: Applicability across gender and race/ethnicity." *Journal of Vocational Behavior* 94 (2016): 79-88; and Lee, Hang-Shim, Lisa Y. Flores, Rachel L. Navarro, and Marlen Kanagui-Muñoz. "A longitudinal test of social cognitive career theory's academic persistence model among Latino/a and White men and women engineering students." *Journal of Vocational Behavior* 88 (2015): 95-103.

32 Although not reported here, WICHE performed numerous post-regression tests to assess the quality of the model, including goodness-of-fit; the discriminatory power of the model; the accuracy, sensitivity, and specificity of the model; and the functional form. The results of these tests suggest the model performs well and is correctly specified.

33 Idaho State Board of Education. *College-Going Dashboard.* https://dashboard.boardofed.idaho.gov/CollegeGoingDashboard.html

34 Idaho State Board of Education. (n.d.) *2022 The Facts: Facts about Idaho's public education system.* https://boardofed.idaho.gov/resources/fact-book/.

35 Kolenovic, Z. & Strumbos, D. (2020, March). *ASAP Students in STEM Majors: Results from the Fall 2015 Cohort.* The City University of New York (CUNY) Office of Academic Affairs. http://www1.cuny.edu/sites/asap/wp-content/uploads/sites/8/2020/04/30099_CUNY_ASAP_STEM_Brief_2019_WEB_m2.-1.9MBpdf.pdf

36 WICHE analysis of May 2010 through May 2021 BLS OEWS Occupational Profiles. For purposes of this analysis, Engineering" occupations are defined as all occupations within SOC Code 17-2000 "Engineers" and 11-9041 "Architecture and Engineering Managers".
Bureau of Labor Statistics. (2022, May). Occupational employment and wage statistics. U.S. Department of Labor. https://www.bls.gov/oes/tables.htm

37 Cecil-Cantrell, C. (2017, May). *Licensed engineers and land surveyors.* Idaho Department of Labor Communications & Research. https://www.labor.idaho.gov/publications/Engineering_Surveyor_Study.pdf

38 Idaho Department of Labor. https://lmi.idaho.gov/data-tools/oews/
Bureau of Labor Statistics. (2022, May). Employment Projections:
Table 1.2 Employment by detailed occupation, 2021 and projected 2031
(Numbers in thousands). https://www.bls.gov/emp/tables/emp-by-detailed-occupation.htm

39 ACEC Research Institute. (2023, May). *Engineering business sentiment 2023 Q2.* American Council of Engineering Companies. https://programs.acec.org/impact-report-21

40 Micron. (2022, September 1). *Micron to invest $15 billion in new Idaho fab, bringing leading-edge memory manufacturing to the U.S.* [Press release]. https://investors.micron.com/news-releases/news-release-details/micron-invest-15-billion-new-idaho-fab-bringing-leading-edge

41 WICHE staff interview with Idaho Department of Labor staff.

42 While WICHE generally prefers precision in using defined terms, there are substantial gray areas in usage on the ground, so further analyses will provide substantial analysis of this point.
National Center for Education Statistics. (n.d.). The classification of instructional programs: Detail for CIP code 11, computer and information sciences and support services. U.S. Department of Education Institute of Educational Sciences. https://nces.ed.gov/ipeds/cipcode/cipdetail.aspx?y=55&cipid=88073.

43 Bureau of Labor Statistics. (2022, September 8). *Occupational outlook handbook: Architecture and engineering occupations.* U.S. Department of Labor. https://www.bls.gov/ooh/architecture-and-engineering/home.htm.

44 Krebs, B., McHugh, C., & Mehl, A. (2023, January). *Educated in Idaho, employed in Idaho.* Idaho State Board of Education. https://boardofed.idaho.gov/resources/educated-in-idaho-employed-in-idaho/

45 Krebs, B., McHugh, C., & Mehl, A. (2023, January). *Educated in Idaho, employed in Idaho.* Idaho State Board of Education. https://boardofed.idaho.gov/resources/educated-in-idaho-employed-in-idaho/

46 Again, although not reported in detail here, the model performed appropriately on standard post-estimation diagnostic tests.

47 Idaho Department of Labor. https://lmi.idaho.gov/data-tools/oews/
Bureau of Labor Statistics. (2022, May). *Employment Projections: Table 1.2 Employment by detailed occupation, 2021 and projected 2031* (Numbers in thousands). https://www.bls.gov/emp/tables/emp-by-detailed-occupation.htm

48 Autor, D. H. (2016, July). *Why are there still so many jobs? The history and future of workplace automation and anxiety.* MIT Initiative on the Digital Economy. https://ide.mit.edu/sites/default/files/publications/IDE_Research_Brief_v07.pdf

49 Smith, M. (2023, February 3). Despite big layoffs, it's still a great time to work in tech, experts say: 'I've seen bad job markets… this is not it'. *CNBC.* https://www.cnbc.com/2023/02/03/despite-big-tech-layoffs-its-still-a-good-time-to-work-in-tech.html ; https://www.ziprecruiter.com/blog/laid-off-tech-workers/

50 Becker, M., Pace, L., & Spolsdoff, J. (2022, October). *Utah's engineering and computer science workforce: Higher education and economic trends.* Kem C. Gardner Policy Institute, University of Utah. https://gardner.utah.edu/wp-content/uploads/ECS-Report-Oct2022.pdf

WICHE
Western Interstate Commission for Higher Education

Idaho Engineering & Computer Science Growth Initiative

Summary of Findings

Disclaimer: Mistakes are ours

1. Is the supply of engineering and computer science graduates from Idaho's public institutions adequate to meet current and projected industry demand?

2. If not, how can the state strategically address the gap between supply and demand?

3

Top Level Findings

- **The current annual supply of graduates from public institutions is not likely to fulfill projected annual industry demand.**

- **Opportunities to increase supply**

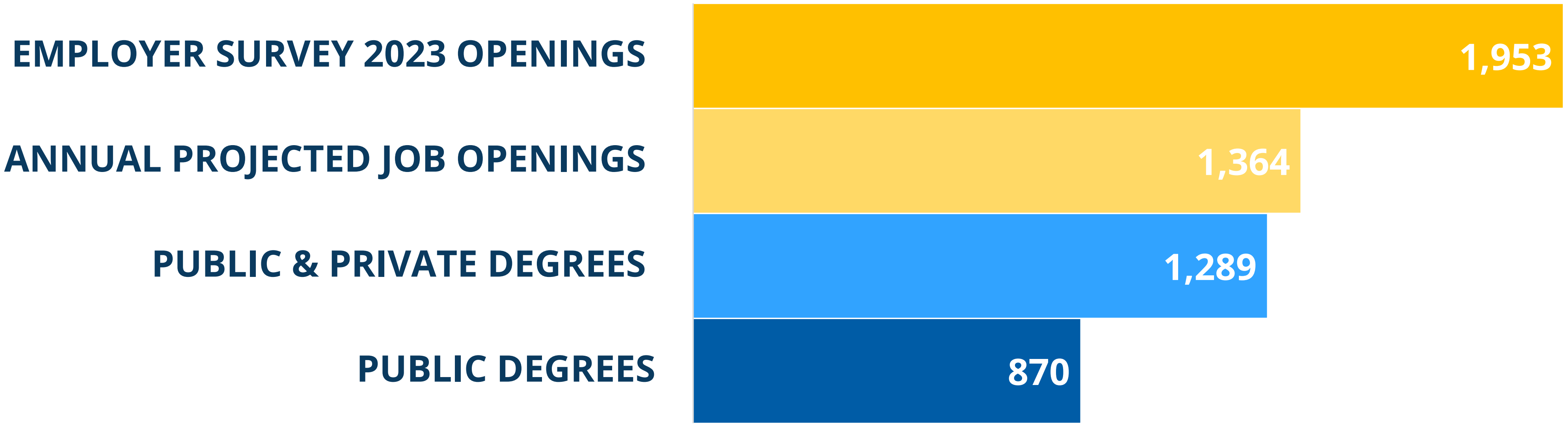
  - Key opportunity for boosting the supply of graduates is **increasing the number of students** who are prepared to enter and succeed in these majors.

    - Improving high school math preparedness;
    - Increasing the number of students (especially female students) who chose engineering/engineering technology or computer and information science as a major
    - Supporting students through graduation
    - Expanding outreach to non-traditional-aged students

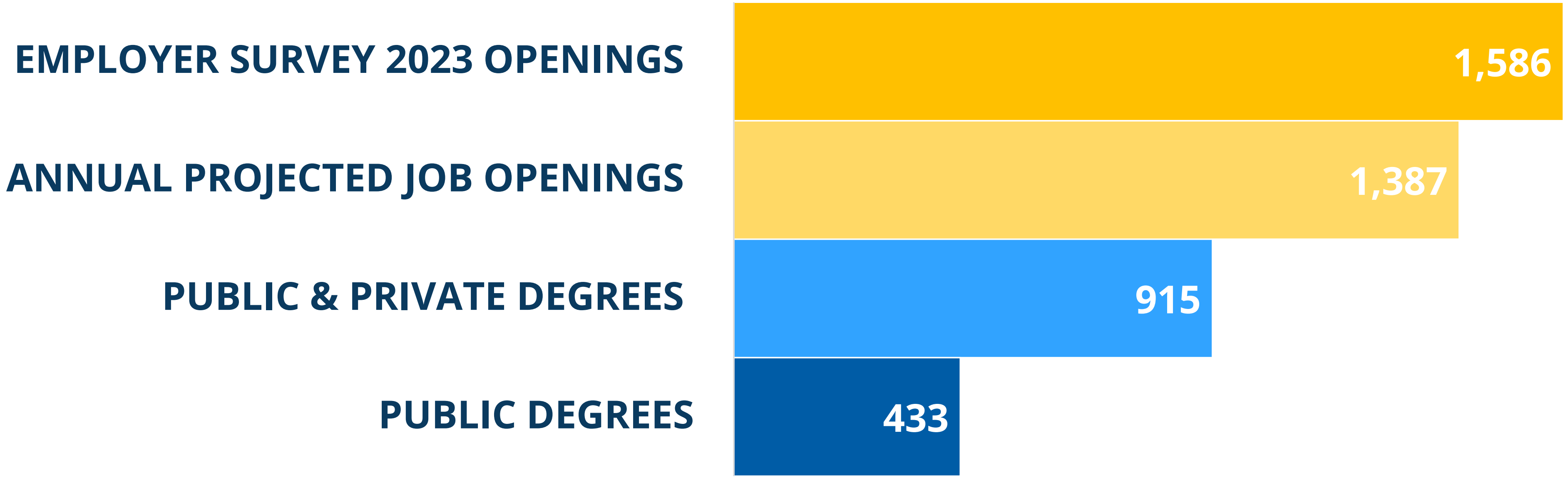
Challenges and Approaches

- **No perfect data source for supply or demand**
- **Understanding potential supply of graduates**
  - Degree production
    - Historical trends
    - Pipeline analysis
    - Model projections
  - Other considerations (ex. migration)
- **Estimating demand for workers**
  - Historical employment trends
  - Occupational projections
  - Employer survey & interviews

Is the supply of engineering and computer science graduates from Idaho's public institutions adequate to meet current and projected industry demand?



Sources: Integrated Postsecondary Education Data System, Idaho Department of Labor Occupation Projections (2020-2030), WICHE Employer Survey



Sources: Integrated Postsecondary Education Data System, Idaho Department of Labor Occupation Projections (2020-2030), WICHE Employer Survey

Engineering and Computer Science Degree Production

- **If current trends continue, fewer than 5 additional engineering bachelor's degrees per year**

- **If current trends continue, fewer than 2 additional computer & information science bachelor's degrees per year**

Student Flow Model: Key Takeaways

- **Current trends don't "naturally" lead to big changes**
  - Leveling off of high school graduates
  - Go-on rate challenges
- **Areas for opportunity**
  - Improving high school to college transition
  - Engaging adult learners
  - Supporting students to and through degrees

Pipeline Analysis: Key Takeaways

- **Math performance** is strongly linked to success in engineering fields
- Significant **gender disparities in selection of majors** of interest, even controlling for math performance
- Opportunity to **keep students in majors of interest**
- Opportunity to **keep more students in state** after graduation

Employer Survey Top-level Findings

- **For graduates with engineering and computer science credentials:**
  - Estimated hiring demand is robust.
  - Many employers already can't find all they need.
- **Employers believe they would benefit from a larger pipeline of Idaho engineering and computer science graduates.**

Idaho has had a fantastic record of producing graduates that can work shoulder to shoulder with engineering graduates from anywhere in the country—Purdue, Yale, Kansas State, Penn State, all the best engineering schools — we produce really, really good engineers which is unusual for a small, rural state.

- Engineering Employer

If we were able to fill all our positions, we'd be able to get more revenue in and more clients and we'd then have demand for more engineers…we've been stifled by an inability to find people to do the work, we have more work than we have people to do.

- Engineering Employer

We've not necessarily tried to materially increase our hiring in the state of Idaho…we just found that it was too challenging to find enough candidates locally. So, we diversified our locations in order to fulfill that [need].

- Tech Employer

How can the state strategically address this gap between supply and demand?

16

Potential Next Steps

► Creating a Shared Vision & Coordinated Plan

- Establish industry-led entity to guide effort in partnership with K-12, community colleges, and universities
- Achieve consensus on focus (ex. “computer science” issue), goals, and short- and long-term strategies
- Account for context (ex. limited student pipeline growth, tight labor market, other Idaho initiatives)

Potential Next Steps

► Identifying Clear Roles & Responsibilities

- Identify individual & collaborative strategic approach for each partner
  - Ex. K-12 and higher ed. collaborate on math preparedness of HS graduates
  - Higher ed. focus on enhancing recruitment of female students and transfer pathways between 2- and 4-year sector
  - Industry & higher education collaborate on attracting non-traditional students into relevant disciplines

Potential Next Steps

▶ Data & Metrics

- Identify meaningful, trackable key metrics and monitor over time
  - Enrollments
  - Major choice
  - Completions
  - Success factors
  - Employment patterns
- Link specific metrics to policy solutions implemented
- Use qualitative data to explore the "why" behind outcomes

Potential Next Steps

► Investing for Impact

- Determine if a broad or a targeted approach will be most effective
- Focus on leveraging Idaho's unique assets in both industry and education
- Balance immediate employer needs with flexible, sustainable planning

THANK YOU!

Patrick Lane & Christina Sedney

WICHE Policy Analysis & Research

phone: 303.541.0238
email: csedney@wiche.edu

www.wiche.edu

WICHE
Western Interstate Commission for Higher Education

21

SUBJECT

Established Program to Stimulate Competitive Research (EPSCoR) Annual Report

REFERENCE

August 2016	EPSCoR provided their annual report to the Board
October 2017	EPSCoR provided their annual report to the Board
October 2018	EPSCoR provided their annual report to the Board
October 2019	EPSCoR provided their annual report to the Board
October 2020	EPSCoR provided their annual report to the Board
October 2021	EPSCoR provided their annual report to the Board

APPLICABLE STATUTE, RULE, OR POLICY

Idaho State Board of Education Governing Policies & Procedures, Section III.W. Higher Education Research

BACKGROUND/DISCUSSION

The Established Program to Stimulate Competitive Research (EPSCoR) is a federal-state partnership designed to enhance the science and engineering research, education, and technology capabilities of states that traditionally have received smaller amounts of federal research and development funds. Through EPSCoR, participating states are building a high-quality academic research base that is serving as a backbone of a scientific and technological enterprise.

Idaho EPSCoR is led by a state committee composed of 16 members, appointed by the Board, with diverse professional backgrounds from both the public and private sectors and from all regions in the state. The Idaho EPSCoR committee oversees the implementation of the Idaho EPSCoR program and ensures program goals and objectives are met. The Idaho EPSCoR office and the Idaho EPSCoR Project Director are located at the University of Idaho. Partner institutions are Boise State University and Idaho State University.

The purpose of EPSCoR awards is to provide support for lasting improvements in a state's academic research infrastructure and its research and education capacity in areas that support state and university Science and Technology Strategic Plans. Idaho EPSCoR activities include involvement in K-12 teacher preparation and research initiatives and projects ranging from undergraduate research through major state and regional research projects.

Consistent with Board Policy III.W.2.d., EPSCoR has prepared an annual report regarding current EPSCoR activities that details all projects by federal agency source, including reports of project progress from the associated external Project Advisory Board (PAB).

ATTACHMENTS

Attachment 1 – EPSCoR Annual Report
Attachment 2 – GEM3 Year 5 PAB Final Report

STAFF COMMENTS AND RECOMMENDATIONS

A full presentation and discussion of the EPSCoR Annual Report was provided to the Instruction, Research, and Student Affairs Committee on October 6, 2023.

BOARD ACTION

This item is for informational purposes only.

IDAHO ESTABLISHED PROGRAM TO STIMULATE COMPETITIVE RESEARCH (EPSCOR): *ANNUAL REPORT - 2023*

DOYLE JACKLIN, IDAHO EPSCOR COMMITTEE CHAIRMAN
ANDREW KLISKEY, PROJECT DIRECTOR

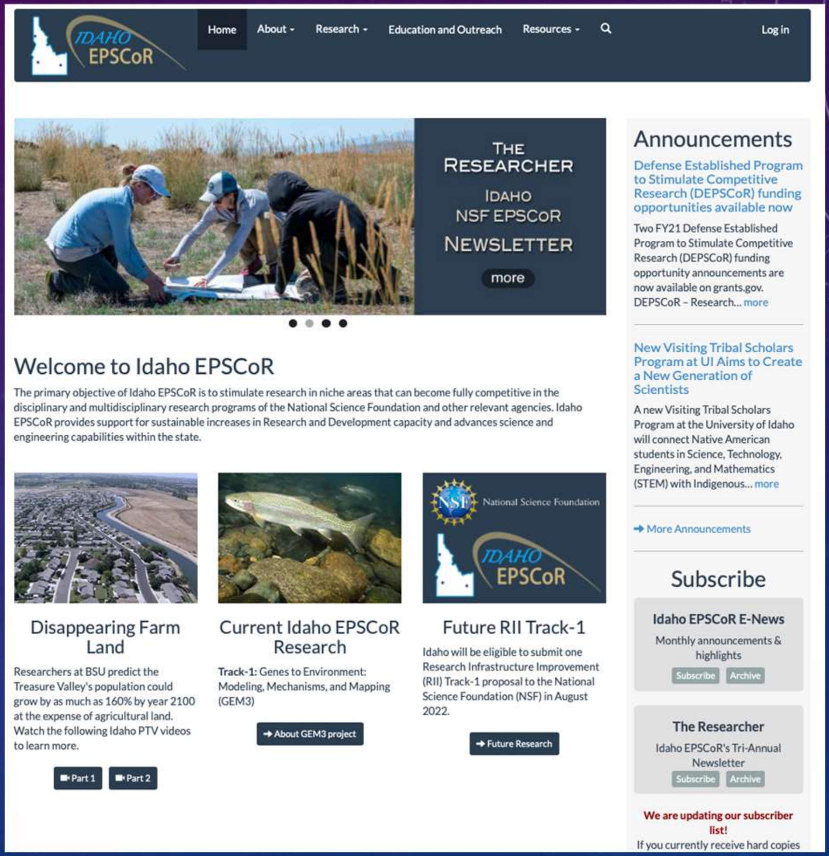
RICK SCHUMAKER, ASSOCIATE PROJECT DIRECTOR

IDAHO STATE BOARD OF EDUCATION: IRSA COMMITTEE
OCTOBER 5, 2023

IDAHO
NSF EPSCoR
ADVANCING GEOGRAPHIC DIVERSITY IN STEM

2023 ANNUAL REPORT

www.idahoepscor.org



- EPSCoR/IDeA National Context
- NSF RII Track-1 "GEM3"
- NSF RII Track-1 "I-CREWS"
- E-CORE and E-RISE

Federal Funding for All Eligible States

Agency	FY21 Enacted	FY22 Enacted	FY23 Enacted	FY24 Budget Request	FY24 Coalition Goals	FY24 House Appropriations Committee	FY24 Senate Appropriations Committee
NSF	$200.0	$215.0	$245.0	$280.68	$281.0		$275
NIH	$396.6	$410.0	$425.95	$426.0	1% of Allocation	$436	$426
DOE	$25.0	$25.0	$35.0	$25.0	$50.0 + $25 for equipment account	$35.0	$35.0
USDA	$65.0*	$66.75*	$68.25*	n/a	15% Language (*)	15%	15%
NASA	$26.0	$26.0	$26.0	$26.0	$33.0	$29	$26
DOD	$17.0	$19.0	$20.0	n/a	$50.0	0	$20
Total	$729.6	$761.75	$820.2	$757.68	**$+ USDA**		

IDAHO EPSCoR

Awards to Idaho

- ✓ RII Track-1, Track-2, Track-4
- ✓ INBRE, COBRE
- ✓ Infrastructure
- ✓ Multiple awards
- ✓ Research, Core

Dollars in Millions.
Source:
EPSCoR/IDeA

CREATING HELPFUL INCENTIVES TO PRODUCE SEMICONDUCTORS (CHIPS) ACT 2022 – H.R. 4346

NSF (Section 10325)

- 20% set aside for **EPSCOR** states, but ramps up from 15.5% to 20% over 7 years;
- Set aside relates to Congress' allocation under the Research and Related Activities and STEM Education Accounts (minus the Antarctic Facilities) only, rather than the whole of NSF.

- FY23: 15.5%
- FY24: 16%
- FY25: 16.5%
- FY26: 17%
- FY27: 18%
- FY28: 19%
- FY29: 20%

IDAHO EPSCoR

GEM3 Genes by Environment

Active EPSCoR/IDeA Awards in Idaho

Agency	Title	Years	Institution(s)	Award Amount
NSF	**Track-1: Idaho Community-engaged Resilience for Energy-Water Systems (I-CREWS)**	2023-2028	U of I (w/ Boise State, Idaho State, CDA Tribe, S-B Tribes)	$20,000,000
NSF	**Track-1**: Linking Genome to Phenome to Predict Adaptive Responses of Organisms to Changing Landscapes	2018-2023	U of I (w/ Boise State, Idaho State)	$20,000,000
NSF	**Track-2: Local and Place Based Adaptation to Climate Change in Underserved Rural Communities**	2023-2027	U of I w/ NV, SC	$6,000,000
NSF	**Track-2**: Developing a Circular Bio-Based Framework For Architecture, Engineering and Construction Through Additive Manufacturing	2021-26	U of I w/AL	$3,974,309
NSF	**Track-2**: Leveraging Big Data to Improve Prediction of Tick-Borne Disease Patterns and Dynamics	2020-24	U of I, w/NV, NH	$6,430,179

IDAHO EPSCoR

Active EPSCoR/IDeA Awards in Idaho

Agency	Title	Years	Institution(s)	Award Amount
NSF	**Track-2**: Genomics Underlying Toxin Tolerance (GUTT): Identifying Molecular Innovations that Predict Phenotypes of Toxin Tolerance in Wild Vertebrate Herbivores	2018-24	Boise State w/ NV, WY	$6,598,285
NSF	**Conference**: NSF EPSCoR Workshop: Intelligent Manufacturing for Extreme Environments	2023-24	U of I	$99,445
DOE	Neuromorphic Systems for Power Grid Cyber-Resilience	2022-25	Boise State	$708,985
DOE	Mechanistic and Kinetic Analysis of Polymer Deconstruction and Modification by Irradiation for Polymer Upcycling	2022-25	Boise State	$583,930
DOE	DNA-Controlled Dye Aggregation – A Path to Create Quantum Entanglement	2019-25	Boise State	$12,500,000

IDAHO EPSCoR

Active EPSCoR/IDeA Awards in Idaho

Agency	Title	Years	Institution(s)	Award Amount
NIH	Idaho INBRE^	2019-24	U of I	$17,088,792
NIH	IDeA award Supplements (10)	2019-24	various	$3,137,439
NIH	COBRE: Matrix Biology*	2014-24	Boise State	$20,815,235
NIH	COBRE: Center for Modeling Complex Interactions^	2015-25	U of I	$21,600,000
NASA RID	Research Infrastructure Development (RID)	2019-23	U of I	$450,000
NASA RID	Research Infrastructure Development (RID)	2022-27	U of I	$1,000,000
NASA Research	Plasma-Jet Printing Technology for In-Space Manufacturing and In-Situ Resource Utilization	2019-22	Boise State	$791,841
NASA Research	CryoIdaho: Building Idaho's Cryosphere Research Community through Analysis of Terrain Effects on Snow and Ice Meltwater Fluxes	2021-23	Boise State	$750,000
NASA Research	On-Demand Manufacturing of Smart Systems for Structural Health Monitoring	2022-25	Boise State	$750,000

IDAHO EPSCoR

Active EPSCoR/IDeA Awards in Idaho

Agency	Title	Years	Institution(s)	Award Amount
NASA - R3	Advanced Manufacturing Dense Nuclear Fuels with Complex Geometries	2022-23	Boise State	$100,000
NASA - R3	Advanced Flip-Chip and TSV Based High-Temperature 3D SiC IC Packing for Venus Surface Exploration	2022-23	U of I	$100,000
NASA - R3	Characterization of Thermal Transport Modes in Porous Materials	2023	Boise State	$100,000
NASA – ISS Flight Op	Evaluation of Biofilm Resistant Coatings for Spacecraft Water Systems	2022-24	U of I	$100,000
NASA – R3	Development of Biofilm Resistant Coatings and Evaluation in Simulated Microgravity	2023	U of I	$100,000
NASA – R3	Detection and Characterization of Spore-Forming Anaerobic Bacteria in an Aerospace Clean Lab	2024	Idaho State	$100,000
NASA – R3	Effects of Lunar and Martian Regolith Simulants on Growth, Survival, and Fitness of Vertebrates: Acute and Chronic Exposure Zebrafish Models	2023-24	Idaho State	$100,000
NASA – Research	IDEAS: LA: IDaho Exploration And Science Lunar Analog	2023-26	Idaho State	$750,000

IDAHO EPSCoR

Recent EPSCoR/IDeA Awards in Idaho

Agency	Summary	Award Years	Institution(s)	Award Amount ($ and %)
USDA	7 of 12 AFRI awards	FY18	U of I, Boise State	$3,171,068 (63% of total)
USDA	6 of 10 AFRI awards	FY19	U of I, Boise State	$11,578,423 (95% of total)
USDA	8 of 21 AFRI awards	FY20	U of I, Boise State	$3,004,362 (42% of total)
USDA	*7 of 16 AFRI awards*	*FY21*	*U of I, Boise State*	*$2,804,362 (50% of total)*
USDA	*12 of 19 AFRI awards*	*FY22*	*U of I, Boise State*	*$4,512,102 (51% of total)*
USDA	*13 of 19 AFRI awards*	*FY23*	*U of I, Boise State*	*$5,350,781 (60% of total)*

$12.67 million in EPSCoR set-aside to Idaho in past three years

IDAHO EPSCoR

Recent Co-Funded NSF Awards to Idaho

	# Grants Awarded	EPSCoR Co-fund $	Total Project $
FY16	5	$1,236,549	$3,117,085
FY17	3	$629,029	$1,258,583
FY18	6	$1,209,066	$3,200,014
FY19	3	$513,723	$1,586,814
FY20	10	$1,773,777	$3,727,664
FY21*	7	$6,799,960	$21,587,841
FY22*	8	$10,857,856	$21,376,004
Total	**34**	**$23,019,960**	**$55,854,005**

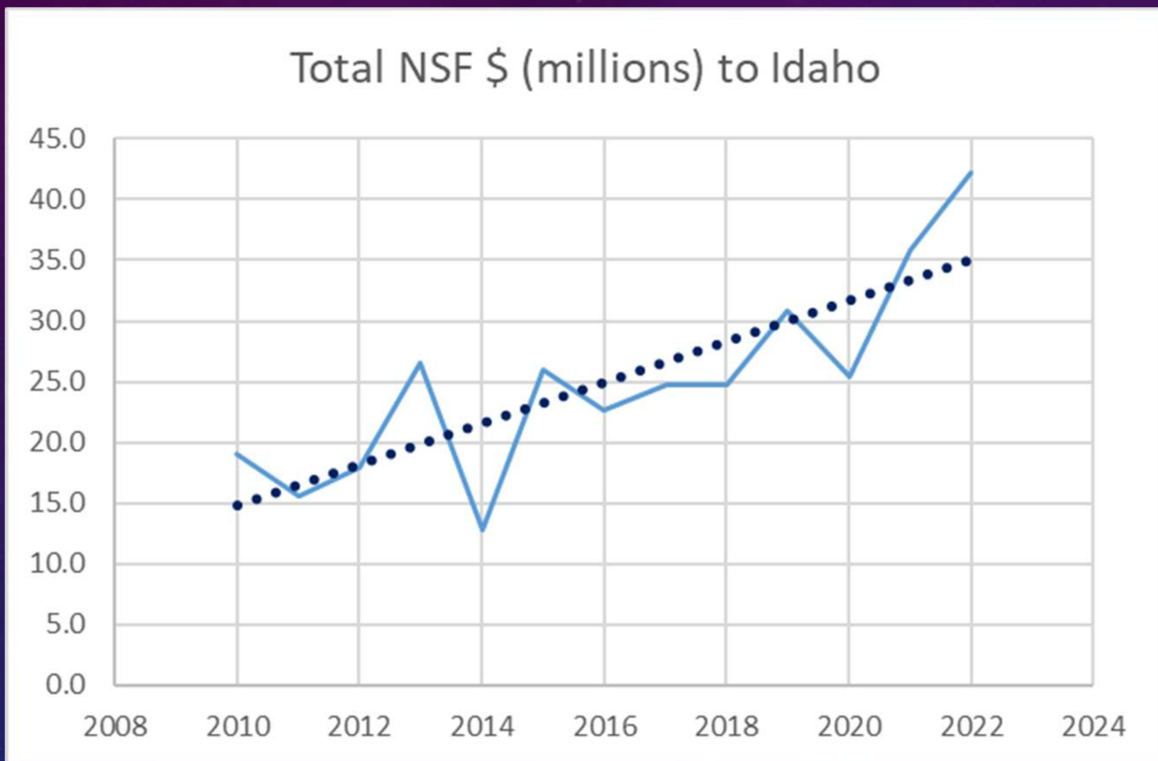
*Including the largest co-Funded Award to Idaho: "*Mid-scale RI-1 (M1:IP): A Deep Soil Ecotron facility to explore belowground communities and ecosystem processes.*" 2021-2026. Led by U of I: $18,950,955

IDAHO EPSCoR

NSF REGIONAL INNOVATION ENGINES

- Each NSF Engine can receive **up to $160 million** to support the development of diverse regional coalitions of researchers, institutions, companies and civil society to conduct research and development that engages people in the process of creating solutions with economic and societal impacts.

Idaho's Research Competitiveness at NSF



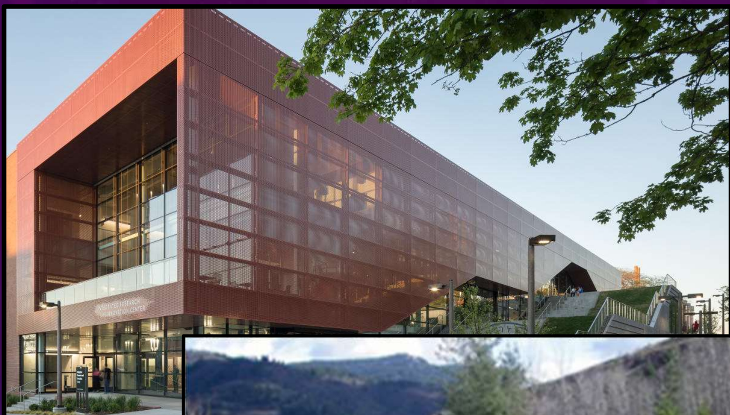
Total NSF funding to Idaho (FY22) = $42.2M, 71% increase from FY18

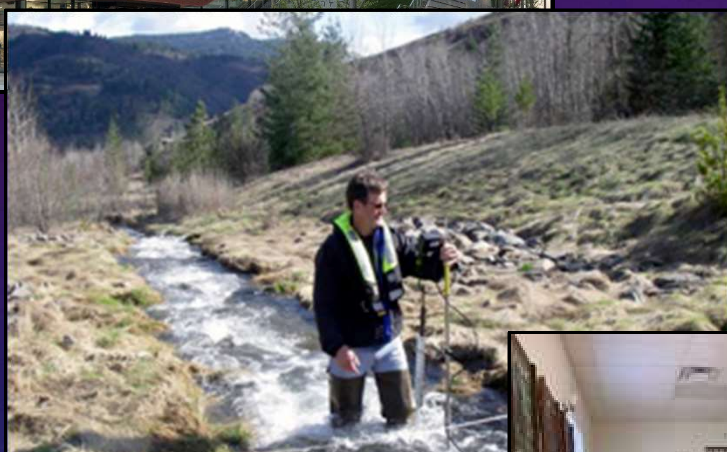
Since FY18, 23% of Idaho's NSF funding is EPSCoR RII+

NSF EPSCoR eligibility is <0.75% share of total NSF funding, excluding EPSCoR RII+

Idaho's share (FY18-28) = 0.31%

IDAHO EPSCOR: *INFRASTRUCTURE IMPROVEMENT STRATEGY*





- GEM3 Track-1: Year 5+
- I-CREWS Track-1: Year 1
- Capacity-building – education, research, WFD, broadening participation, partnerships

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IDAHO EPSCoR

Idaho Track-1 RII: "GEM3" *Genes to Environment: Modeling, Mechanisms, and Mapping* - Oct 2018 – Sep 2023

Vision: Idaho will lead the nation with thriving, collaborative, and inclusive research to discover and predict how plants, animals, and people interact and adapt to changing environments, resulting in the sustainable management of natural resources.

GEM3
Genes by Environment

GEM3 Project Outputs

New Faculty
- **6 new faculty hired** (5 female / 1 male / 1 URM)

Post Docs
- **20 post docs** (7 female / 13 male / 1 URM)

Grad Students
- **67 grad students** (43 female / 24 male / 6 URM)

Under Grads
- **94 undergrads** (43 female / 51 male / 24 URM)

Students Graduated
- **30 grad students / 50 undergrad students**

GEM3 Project Outputs

Publications

- **81 pubs** (Year 1-5, GEM3 support)
- **25 pubs** (Year 5 alone, GEM3 support)

NSF Proposals (non-EPSCoR)

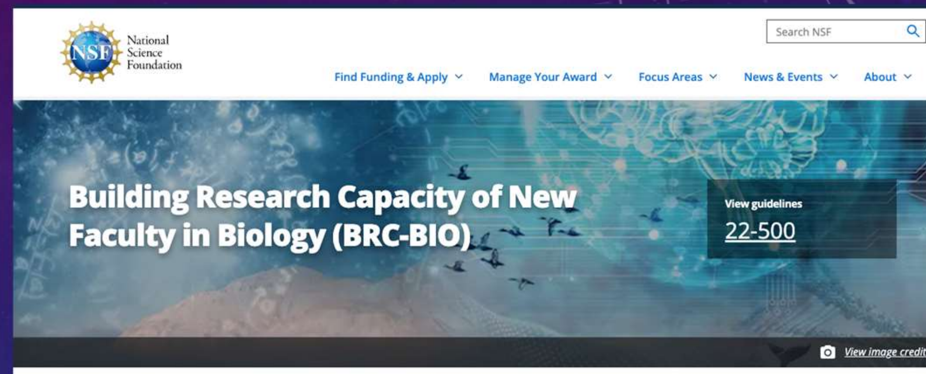
- **155 proposals / $215.5M** (Year 1-5, submitted)
- **33 proposals / $67.0M** (Year 5 alone, submitted)

NSF Funding (non-EPSCoR)

- **66 awards / $27.2M** (Year 1-5 awarded)
- **18 awards / $6.2M** (Year 5 alone, awarded)

EPSCoR GEM3 Seed Award gives rise to NSF's Broadening Research Capacity in Biology Award (Award #2312572!)

Environmental variation and the disruption of biotic local adaptation: Predicting consequences of changing microbial interactions for plant populations



Funding in 2024-2027 for $500K:

- 2 BSU graduate students
- 6-10 undergraduate researchers
- Programs to expand diverse participation in biology
- BSU Biology Equipment & early career

Allison Simler-Williamson (BSU)

Marie-Anne deGraaff (BSU)

Leonora Bittleston (BSU)

Trevor Caughlin (BSU)

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IDAHO EPSCOR: *INFRASTRUCTURE IMPROVEMENT STRATEGY*

Student Research Stories

Carlos Dumaguit,
M.S. graduate student at Boise State University
Ph.D. Student at Utah State University

Research focus:
Carlos Dumaguit, a recent MS graduate student from Boise State University (BSU) was part of a GEM3 team leading ground-breaking work in bioinformatics at BSU. While research on the genomic basis of plant resilience towards drought has been conducted in crops and model plants, fewer studies have evaluated natural plant communities.

The team provided a resource for identifying genes underpinning drought across a broad range of plants using a literature mining approach with the newly developed package G2PMineR.

Cayden Whipkey,
undergraduate SARE student
College of Western Idaho

Research Focus:
Cayden Whipkey is an undergraduate student from College of Western Idaho (CWI) majoring in Biology with an emphasis in Natural Resources. His research focus is on mapping invasive species at the social-ecological interface. Cayden and team work to develop maps that can aid in eradicating these species by identifying hotspots of invasion that can be targeted for control by using geospatial technology to map invasive plants.

These technologies will include processing aerial imagery to identify invasive plant habitat, using high-precision GPS units to mark the location of plants, and GIS software to develop sampling schemes. The team's work is helping to improve human well-being and biodiversity.

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IDAHO EPSCOR: *INFRASTRUCTURE IMPROVEMENT STRATEGY*

Student Research Stories

Claire Vaage, former SARE student at Boise State University (BA, Environmental Studies)

Graduate Student in the Freshwater Ecology and Conservation Lab, SAFS University of Washington

Research focus:

Claire's research provides a methodology that uses remotely sensed data to map riparian habitat. Riparian vegetation is critical to dryland ecosystem functions. The sagebrush steppe dominates southern Idaho and includes riparian habitats which are under constant pressure from agriculture, wildlife, and recreational use.

This work isolates the riparian vegetation within the Dry Creek Experimental Watershed and bolsters the value of the sites data repository. Upon completion, the results of the research will enable accurate delineation of riparian habitat within sagebrush steppe ecosystems and has significant implications for Idaho since incorporating these methods could lead to improved management and help restore riparian function across landscapes.

Treyton Harris, M.S. graduate student
Idaho State University

Research Focus:

Treyton's research focuses on evaluating effects of genome size and ploidy level on resource use and establishment of the foundation species big sagebrush, Artemisia tridentata. Treyton began his sagebrush research as an undergraduate student in the Summer 2021, working on a method to non-destructively estimate the age of big sagebrush, and how this method may vary between environments. He is currently part of the NSF EPSCoR GEM3 team that is working on a seed grant that investigates the ecological impacts of genome size variation in big sagebrush.

These ecosystems are widely valued for supporting diverse plants and animals, including wild game species, as well as grazing by livestock. There is great interest in restoring sagebrush ecosystems in Idaho and across western North America, but current restoration efforts frequently have low success. The team is working to help to identify sagebrush plants that are well-suited for particular resource conditions and that will enhance the success of restoration efforts.

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IDAHO EPSCOR: *INFRASTRUCTURE IMPROVEMENT STRATEGY*

Student Research Stories

Drew Wyman,
undergraduate SARE student
College of Idaho

Research focus:

Drew's research focuses on the chemical environment of the Sagebrush microbiome. Sagebrush (Artemisia tridentata) is the most widespread shrub in North America, and a dominant plant species in the southern Idaho high desert ecosystem. The chemistry of sagebrush foliage varies distinctly according to species, subspecies, and environmental factors. To understand the interaction of sagebrush plants with other high desert animal species at the chemical level, the high levels and wide diversity of defensive secondary metabolites produced by these plants must be considered.

Research includes characterizing the metabolism of sagebrush defensive compounds by liver enzymes of herbivores in order to understand how sagebrush chemistry determines whether this shrub can be used as a food source by local herbivores.

John Masingale,
Ph.D. student in Natural Resources and
Graduate Research Assistant
University of Idaho

Research Focus:

John is currently working with the GEM3 trout mechanisms team at the University of Idaho on a common garden experiment to discover genotype x environment interactions that contribute to thermal adaptation in redband trout.

Research includes collecting newly hatched redband trout from three distinct ecotypes (desert, cool montane forest, and cold montane forest). The team then conducted a series of behavioral and physiological experiments to determine interpopulation differences in thermal tolerance and habitat selection cues.

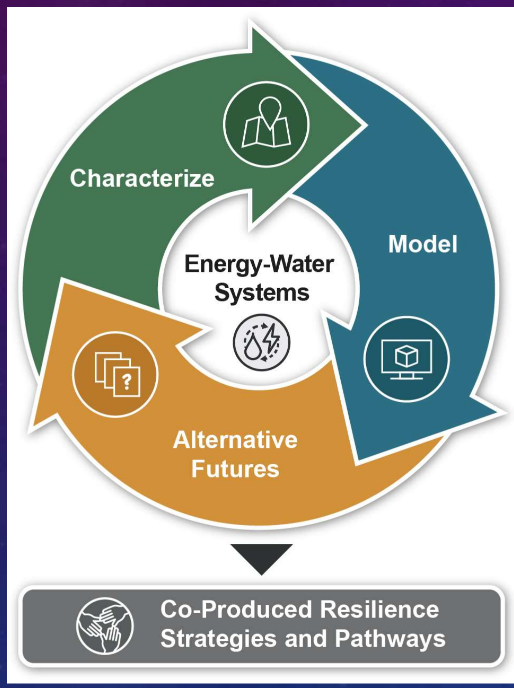
Working with the GEM3 modeling team, phenotypes and their associated adaptive loci will be integrated into agent-based models that simulate and predict the adaptive capacity of natural populations in response to climate change scenarios spanning the next century.

IDAHO LEGISLATIVE SERVICES OFFICE REQUEST

- 677 students supported in research and education at Idaho universities and colleges (BSU, ISU, UI, CSI, CWI, LCSC) through NSF EPSCoR RII Track-1 since 2013.
  - 452 undergraduate students who pursued STEM degrees
  - 225 graduate students who pursued masters and doctoral degrees
- data on nine learning outcomes show that the undergraduates in these EPSCoR programs gained measurable and significant improvements in knowledge, skills, and competences required for long-term success in science, technology, engineering, and mathematics disciplines and careers
- Program data demonstrate that EPSCoR-supported students, particularly undergraduates, have a higher graduation rate than the average rate at our Idaho universities in general

RII TRACK-1 NEW AWARD

IDAHO COMMUNITY-ENGAGED RESILIENCE FOR ENERGY-WATER SYSTEMS (I-CREWS)



Critical national and state need: enhancing access for communities to diagnostic science for proactively addressing impacts of climate, population, and technological change on the interplay between energy and water

Scientific vision: build a world class capacity to characterize, model, and assess a range of futures to promote the resilience of E-W systems to climate, population, and technological change

Awarded: Aug 1, 2023 (thru July 31, 2028)

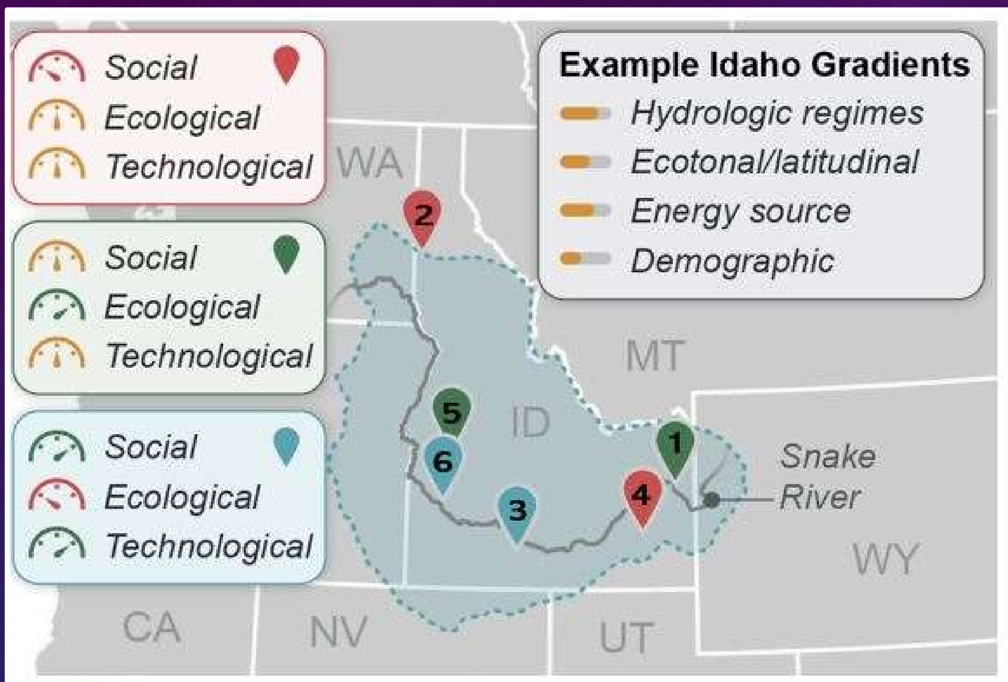
IDAHO EPSCoR

GEM3 Genes by Environment

IDAHO COMMUNITY ENGAGED RESILIENCE FOR ENERGY WATER SYSTEMS “I-CREWS” - WHO?

- Universities (BSU, ISU, UI)
- PUI’s (CSI, CWI, LCSC)
- Idaho National Lab
- Tribal Nations (Shoshone-Bannock Tribes, Coeur d'Alene Tribe are sub-awardees)
- Industry, state, and federal partners
- State-wide 8 new early-career hires, 10 postdocs, and 20 graduate students
- Communities through co-production and educational inititives

CURRENTLY IN STRATEGIC PLANNING PHASE



- Refine study site location - where will the community-engaged work take place?
- Refine language and develop long-term approaches to shared understanding.
- Roles of institutions and partners
- Develop a plan to connect elements.
- Community engagement plan and activities.

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IDAHO EPSCOR: *INFRASTRUCTURE IMPROVEMENT STRATEGY*

Box 1: I-CREWS New Faculty Hires

Characterize E-W Systems:

Hire 1: Environmental governance (School of Public Service, BSU)
Hire 2: Tribal water resource scientist (College of Natural Resources, UI)
Hire 3: Environmental historian (College of Lett., Arts, and Soc. Sci., UI)

Model E-W Systems:

Hire 4: Data scientist / statistician (College of Arts and Sciences, BSU)
Hire 5: Environmental / civil engineer (College of Sci. and Engineering, ISU)
Hire 6: Power and water systems modeler (College of Engineering, UI)
Hire 7: Systems engineer (College of Engineering, BSU)

Determining Alternative E-W Futures:

Hire 8: Resilience social scientist (College of Arts and Letters, ISU)

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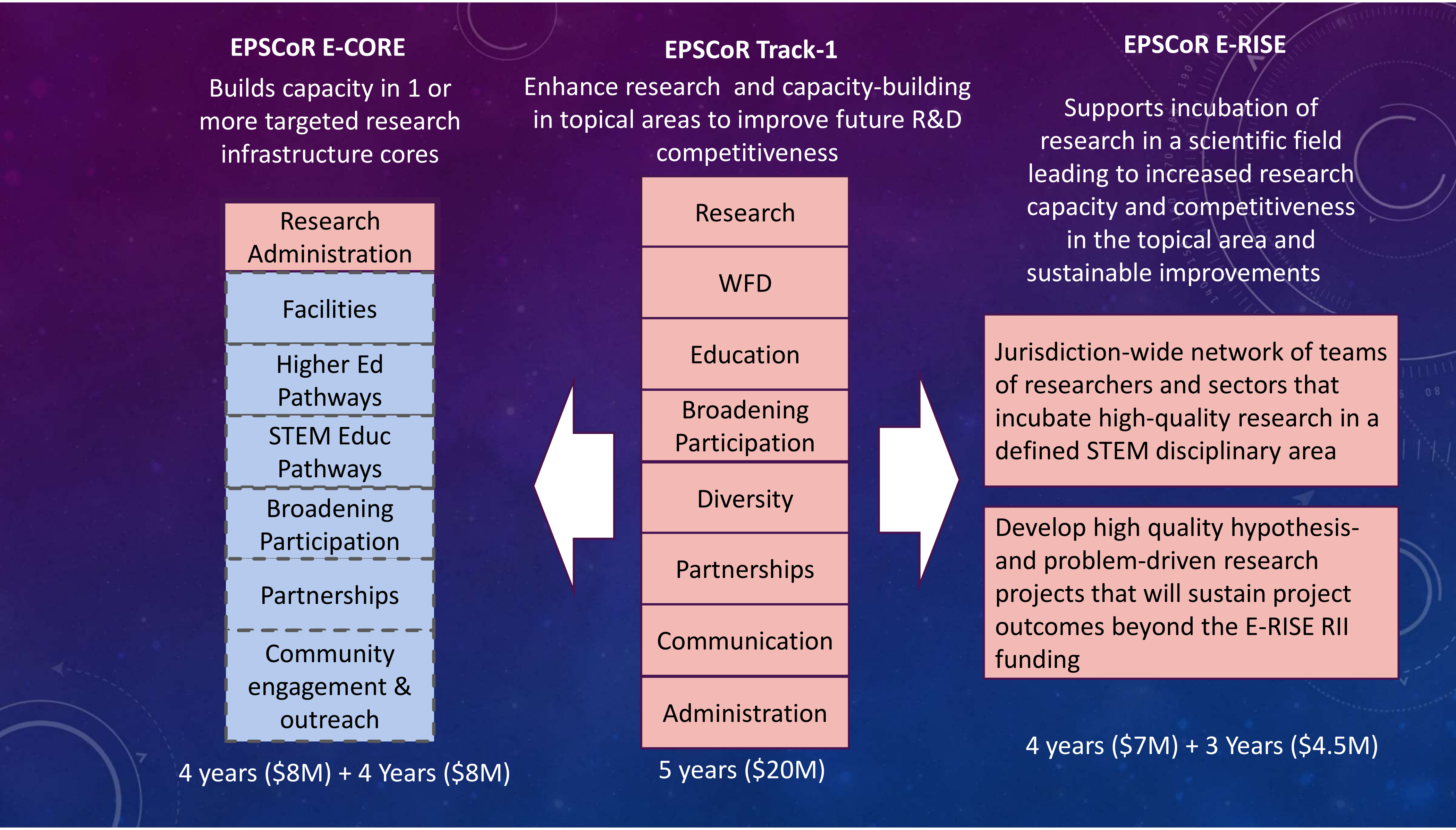
NSF EPSCOR ANNOUNCES TWO NEW PROGRAMS TO REPLACE RII TRACK-1 PROGRAM:

E-CORE
E-RISE

NSF EPSCoR
ADVANCING GEOGRAPHIC DIVERSITY IN STEM


EPSCoR E-CORE
Builds capacity in 1 or more targeted research infrastructure cores
Research Administration
Facilities
Higher Ed Pathways
STEM Educ Pathways
Broadening Participation
Partnerships
Community engagement & outreach
4 years ($8M) + 4 Years ($8M)
EPSCoR Track-1
Enhance research and capacity-building in topical areas to improve future R&D competitiveness
Research
WFD
Education
Broadening Participation
Diversity
Partnerships
Communication
Administration
5 years ($20M)
EPSCoR E-RISE
Supports incubation of research in a scientific field leading to increased research capacity and competitiveness in the topical area and sustainable improvements
Jurisdiction-wide network of teams of researchers and sectors that incubate high-quality research in a defined STEM disciplinary area
Develop high quality hypothesis- and problem-driven research projects that will sustain project outcomes beyond the E-RISE RII funding
4 years ($7M) + 3 Years ($4.5M)

Building Research Competitiveness through EPSCoR/IDeA

IDAHO EPSCoR

https://www.idahoepscor.org

GEM3 Genes by Environment

https://www.idahogem3.org

NSF

https://www.nsf.gov/od/oia/programs/epscor/

https://basicresearch.defense.gov/Pilots/DEPSCoR-Defense-Established-Program-to-Stimulate-Competitive-Research/

https://science.osti.gov/bes/epscor

https://www.nigms.nih.gov/Research/DRCB/IDeA/Pages/default.aspx

https://www.nasa.gov/stem/epscor/home/index.html

https://www.nifa.usda.gov/grants/programs/agriculture-food-research-initiative-afri/afri-fase-epscor-program

IDAHO NSF EPSCoR PROJECT ADVISORY BOARD (PAB) REPORT ON THE IDAHO EPSCoR RESEARCH INFRASTRUCTURE IMPROVEMENT TRACK-1 COOPERATIVE AGREEMENT

(#IIA-1757324)

YEAR FIVE

OCTOBER 2022

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INTRODUCTION

The Research Infrastructure Improvement (RII) project "Linking Genome to Phenome to Predict Adaptive Responses of Organisms to Changing Landscapes" was funded by the National Science Foundation (NSF) Established Program to Stimulate Competitive Research (EPSCoR) and led to the Idaho RII Track-1 Cooperative Agreement. The project is referred to as *GEM3* for *Genes to Environment: Modeling, Mechanisms, and Mapping*. The Idaho EPSCoR Project Advisory Board (PAB) met in person in October of 2022 as part of the *GEM3* annual meeting to hear progress toward the goals set forth in the Strategic Plan, which was approved in May 2019. The purpose of the annual meeting was for the community as a whole to engage in person for the first time since the pandemic. The meeting focused on cross-component updates and project syntheses during this fifth and final year of funding. The PAB was asked to provide objective feedback on the progress to date as compared to the milestones for year five from the Strategic Plan as well as suggestions for sustainability as the project nears completion. A roster of current PAB members is provided in Appendix A.

NSF EPSCoR funded this 60-month award in October 2018 at $20 million over five years. The State of Idaho has committed to contribute $4 million in additional funds towards the project over the five-year period. The University of Idaho (UI) is the fiscal agent for the award, and Boise State University (BSU) and Idaho State University (ISU) receive funding through subcontracts. Dr. Andrew Kliskey is the Idaho EPSCoR Project Director (PD) and the Principal Investigator (PI) for the RII Track-1 Cooperative Agreement. Co-Principal Investigators are Dr. Christopher Caudill (University of Idaho), Dr. Jennifer Forbey (Boise State University), and Dr. Colden Baxter (Idaho State University).

This report is intended to provide feedback to the GEM3 project team as they work toward syntheses and sustainability during the final year and as they look to the future of the GEM3 research and educational components. This report is comprised of three parts: notable strengths of the project, challenges and recommendations, and conclusions.

STRENGTHS

Despite two years plus of difficulty and challenges caused by the pandemic, the GEM3 community has thrived and met all milestones outlined in the Strategic Plan. All components—Research, Education, Diversity, Equity, and Inclusion—work synergistically to create the vibrant community that makes this project unique. Project leadership provides management and support for the team to accomplish its goals. Below are the identified strengths in Research, Education, Diversity, Equity and Inclusion, and Management as documented by the PAB at this final GEM3 annual meeting.

RESEARCH

Overall, GEM3 research remains very strong in this last year of the project. Particularly noteworthy is the sequencing of the sagebrush genome. This goal was exceptionally ambitious at the project's outset, and through the leadership of Sven Buerki and the hard work of team members, the goal has been met.

This accomplishment opens many doors to research during the last year of the project and into the future.

There has been a concerted effort to co-locate some of the sagebrush and trout studies. This is especially true for mapping fish habitat and sagebrush spatial distribution using remote sensing and some of the modeling studies. Use of Unmanned Aircraft Systems (UAS) has allowed the team to map large areas with great precision and resolution and to link the mapping efforts to key life history components of sagebrush and their competitors and to critical habitat needs of trout during different life stages.

Seed funding to complex microbiome community studies has been highly successful at opening new lines of research and education in GEM3. This can be seen in additional funding that has been secured by these researchers and in the research results that are seen in publications and in the poster session. The VIPs that integrate this work are flourishing and involving undergraduates at Primarily Undergraduate Institutions (PUIs) in GEM3 research in an impactful way.

Good productivity of all research is evidenced in publications, conference presentations, and grant proposals submitted and accepted. The team met their Strategic Plan milestones and surpassed them in many instances. As the PAB has suggested previously, the current effort should focus on integration and synthesis papers that will inform and guide the field in years to come.

The poster session highlighted the success of the project in both research and education. Numerous undergraduate students shared the results from their summer SARE research, and their enthusiasm and interest in staying connected with their research teams was abundantly clear. It would be an added benefit to have these students serve as co-authors on upcoming research papers. This would benefit their careers, particularly if they have an interest in graduate school, and strengthen the undergraduate research accomplishments of the project.

Graduate student leadership has been exemplary. The students identified their goals for better integration post-pandemic, created plans to accomplish those goals, and implemented events to work toward them with the assistance of the Idaho EPSCoR office. They successfully created a strong community of both undergraduates and graduate students working together toward GEM3 outcomes.

Education, Diversity, Equity and Inclusion

The Vertically Integrated Projects (VIPs) are well-established and recruiting large numbers of students at both PUIs and the research universities. These VIPs are an excellent mechanism through which the project engages undergraduates in science that is directly related to GEM3 research. They also have acted as a recruiting tool, attracting students into the SARE program for summer research. The PAB was impressed by the innovative and highly diversified research presented by these students at the poster session and by their understanding of how their projects fit into the larger GEM3 research agenda.

Project Scientia, a novel and successful project that opens lines of communication between the Spanish speaking population in Idaho and the researchers, has created additional products that are useful to the EPSCoR community and beyond. The PAB encourages continued investment in this type of outreach and science communication, which is both useful to GEM3 and also a mechanism to involve a broader audience of citizens potentially able to apply the research to rural problems.

The PUIs' involvement in GEM3 has matured in the past year to be impactful to both PUI faculty and students. Through the PUI faculty fellows program, these academic leaders have benefited from immersive research experiences at Boise State University that led to the creation of laboratory modules for use in undergraduate classes. Additionally, students in these classes have become inspired by this experience and have applied to be SARE students. A large number of PUI students (17 of the 31 undergraduates) participated in SARE in 2022, which shows the direct impact of this program on recruitment of students into GEM3 research and potential STEM career pathways.

The Tribal Scholars positions held by Shanny Spang Gion and Laticia Herkshan have led to stronger partnerships between the Tribes and the universities. Their important work on Nation building in STEM is a highlight of GEM3. Support for these positions appears to be growing, and the need to secure long-term funding for them remains critical to ensure that these individuals can grow as scholars and continue to champion Native American perspectives in science.

Management

The Idaho EPSCoR State Committee continues its long-standing tradition of success in working with university administration to successfully implement the EPSCoR program. Daily management of this large multi-faceted project has been complicated by the pandemic. However, despite all of the obstacles, the Project Director and Assistant Project Director have been able to lead the team to accomplishing their Strategic Plan goals. They are supported by an excellent staff with organizational management expertise. The staff should be commended for their high-quality logistical support for key operations including contracts/budgets, communications, meetings, reporting, and evaluation. Without this support, the project would not have accomplished its goals. It is important to keep this staff in place during the transition to the next Track 1 project.

Challenges & Recommendations

As GEM3 funding winds down, it will be important to provide support for Graduate Research Assistants (GRAs), post-doctorates and staff. Transition pathways for GRAs, post-doctorates, and new graduates should be identified and implemented. The team should continue to seek sources of funding to sustain the momentum of GEM3 research and education activities. This is particularly important over the final year of the project. The Idaho EPSCoR office can provide grant writing support to assist in the sustainability of these efforts.

As mentioned in previous years, the importance of synthesis publications is critical for enduring communication of key results from the GEM3 project. Integration that leads to synthesis and keystone publications needs sustained effort and funding as the project comes to completion. Synthetic research papers highlighting major successes of the GEM3 endeavor need to remain a top priority.

At the meeting, less focus was given to the trout research area. The PAB encourages the team to continue to synthesize trout research into publications and conference presentations to share their work as the project sunsets.

Improved and more successful collaborations through the Tribal Scholars positions are gaining momentum. Sustaining this work through permanent funding for these positions will ensure long-term success. In addition, the institutions should redouble their efforts to recruit doctoral Tribal scientists for tenure-track positions at Idaho research universities, as is occurring regionally in the western US.

CONCLUSIONS

The GEM3 project has been highly successful in meeting the goals set forth in the Strategic Plan over the past four plus years. In this final year, the PAB noted key strengths in both research and education that lay the groundwork for future projects that should build on these successes. The PAB would like to thank the Idaho EPSCoR Statewide Committee and all of the faculty, students, post-doctorates, and staff for inviting us to provide feedback on your project throughout the years. It is hoped that these final recommendations will help as you finalize your accomplishments and move toward future research and education projects.

Appendix A. Project Advisory Board Members, 2022

Name	**Affiliation**
Clifford Dahm	Professor Emeritus of Biology, University of New Mexico; Former Lead Scientist, California Delta Science Program
Jason Dunham	Supervisory Research Ecologist/Professor, USGS; Courtesy Faculty Appointment, Department of Fisheries and Wildlife-Aquatic Ecology, Oregon State University
Erik Goodman	Executive Director, BEACON Center for the Study of Evolution in Action; Professor of Electrical and Computer Engineering and of Mechanical Engineering and of Computer Science and Engineering, Michigan State University
Michael Khonsari	Dow Chemical Endowed Chair, Professor of Mechanical Engineering, Louisiana State University; Project Director, LA EPSCoR PD; Associate Commissioner for Sponsored Research and Development Programs, Louisiana Board of Regents
Camille Parmesan	Professor, CNRS Ecology Institute (SETE), Moulis, France; School of Biological and Marine Sciences, Plymouth University, U.K.; Department of Geological Sciences, University of Texas at Austin, U.S.A.
Anna Waldron (PAB chair)	Evaluation Consultant and Principal at Waldron Educational Consulting, LLC