Michael M. Crow

At-Risk Assessment

FY 2024

Arizona State University

July 19, 2024

TO: Cecilia Mata
Chairman, Arizona Board of Regents

FROM: Michael M. Crow
President, Arizona State University

CC: Arizona Board of Regents
Chad Sampson
Jennifer Pollock

RE: FY2024 At-Risk Compensation Goals

I am excited to provide a summary of my At-Risk goals outcomes as my report for FY2024 and for the multi-year goals that were put in place in FY2021.

ASU is continuing to experience positive movement on nearly all fronts in which we are engaged. The one exception is with regard to the rate of growth associated with students from Arizona. We are experiencing growth in students from Arizona and growth in graduates from Arizona but not at the double-digit levels as stated for the goal. This report will reflect the progress that we have made on that goal as well as the progress that we have made on all of the other goals which were attained.

Attached to this memo is a detailed summary of the goal attainment performance for each of the single year FY2024 At-Risk compensation goals as well as the multi-year FY2021-FY2024 At-Risk goals.

ASU continues to establish institutional bests, performance records, in nearly all categories of our activity. We are continuing with enrollment growth, revenue growth, research performance growth, partnership growth, fundraising growth, etc. These At-Risk goals are those areas of focus negotiated with the Regents both three years ago and last year.

These are important messages to the institution relative to priorities and important performance enhancement mechanisms for our overall efforts.

I will begin with the one-year At Risk goals.

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One-year At-Risk Goals:

1) **FY2023-2024 At-Risk Goal #1: Science and Technology Economic Development Strategy**

Goal Status: ACCOMPLISHED

This is an area of significant focus on our part at ASU with great positive outcome. We believe that through our efforts we have made substantial contributions to the building of the local trajectory for enhanced economic development based around knowledge organizations and knowledge enterprises through our expanded and impactful research activities and initiatives as well as carefully selected areas of focus. The report summarizes what we have done but probably doesn't quite capture the intensity of our efforts. This is an important and exciting goal, and I am pleased to indicate that we have achieved it.

2) **FY2023-2024 At-Risk Goal #2: All-Industry Training Center**

Goal Status: ACCOMPLISHED

We have designed and launched the center. It is operational. It is working wholeheartedly at fever pitch to be of greatest service to the rapidly expanding microelectronics industry and its workforce development here in Greater Phoenix and Arizona. In fact, we are contributing mightily to this rapid expansion and workforce development through the evolution of our Learning Enterprise, the expansion of our Fulton Schools of Engineering and the design and initiation of new kinds of programs. Workforce development has become a new and unique type of outcome for ASU and there is great excitement about this achievement.

3) **FY2023-2024 At-Risk Goal #3: Artificial-Augmented Intelligence Strategy**

Goal Status: ACCOMPLISHED

This has been a very exciting opportunity for ASU to move its innovation capacity collectively into the realm of capitalizing on the AI moment. We are well underway and have included in the report the quite remarkable progress that ASU teams have made and it is worth noting that this strategy and its investments and outcomes will dramatically enhance our productivity, our effectiveness in our teaching, learning and research programs, and our efficiencies in all of these programs. This is a tremendous set of achievements.

Additionally, this year I had a goal for which there was not an incentive but a penalty and that was "**could we fully implement the general educational program**." This has been accomplished and has facilitated, through board leadership and focus, impactful positive transformation in the general education curriculum at ASU. I am very proud of

our faculty and staff that have made this accomplishment successful and it is fully being implemented.

Multiple-year At-Risk Goals:

1) **2021-2024 Multiple-Year At-Risk Goal #1: Demonstrate increased enrollment and student success in adaptive learning courses through offering more than 15 courses, with an increase in overall course completion (grade C or better) to more than 80% (from a base of less than 50%).**

Goal Status: ACCOMPLISHED

This is an area of unbelievable achievement for ASU. We have pioneered adaptive learning tools to enhance learning outcomes at every level and in this multi-year goal. We have not only increased the enrollment but dramatically exceeded, through rapid expansion of the use of these materials, tremendously positive outcomes.

2) **2021-2024 Multiple-Year At-Risk Goal #2: For Arizona students, increase enrollment and number of graduates by more than 10%.**

Goal Status: NOT ACCOMPLISHED

As I indicated earlier in this memo, while we have made progress—in fact more progress than others—toward our goal of increasing enrollment in graduation of Arizona residents by 10 percent, we did not achieve this within the three-year timeframe. There are no excuses other than we need to figure out how to do this. We did go through COVID in this three-year window and I believe that had some impact. But, in the past ten years we have made substantial progress and this continues to be an ongoing area of focus. The issues here are complicated and they have to do with several factors in the design of the educational system writ large in Arizona, certain cultural elements in Arizona, etc. What we have done in this same three-year timeframe is launch a number of expanded projects, programs and initiatives that we believe have been impactful. For instance, in AY24-25 we will see among the highest in-state enrollment increases that we have seen in the last 15 years. While this three-year goal was not met, the trendline has been attained and the focus has not been removed. We are maintaining this goal for ongoing focus and ongoing achievement.

3) **2021-2024 Multiple-Year At-Risk Goal #3: Complete the design of the Global Futures Laboratory, with anticipated engagement of more than 700 faculty. Successfully merge the three schools of the College of Global Futures into a unique college with thousands of students (majors and minors).**

Goal Status: ACCOMPLISHED

Our Global Futures Laboratory is the signature, unique intellectual development program for Arizona State University. We have built four new schools within this laboratory inside a College. We have launched scores of new research initiatives. We have secured substantial philanthropy and funding for our initiatives. We now have thousands of students that are involved in this overall activity. All in all, this is a massively important and achieved goal.

4) **2021-2024 Multiple-Year At-Risk Goal #4: Build and document enhanced regional collaboration within Arizona higher education.**

Goal Status: ACCOMPLISHED

This is an area where I think we have seen tremendous success in enhancing our relationships with NAU, with UA and among the three of us. For instance, in 2010, we had $4 million of research obligations with all three universities involved in the projects. This year, in 2024, we had $13 million. Between UA and ASU, we had $17 million in 2010, and now we have over $60 million. These are significant positive changes. In terms of regional collaborations, we have gone from a few dozen to low hundreds and we are very excited about that, and the other partnerships detailed in the report. This is a clearly accomplished and important goal.

5) **2021-2024 Multiple-Year At-Risk Goal #5: Submit a report that demonstrates substantial expansion of ASU Digital Prep within Arizona to at least 150 schools, with a focus on rural and underperforming schools.**

Goal Status: ACCOMPLISHED

This took off like a rocket and has been expanding and evolving ever since in many, many positive ways. This is an unbelievably achieved goal and we are very excited about what we are able to do.

All of the details of these projects and programs are in the attached binder. I would be happy to answer questions or engage with any of you on any of these matters.

Thank you for your ongoing support and the use of these goals for a number of important institutional development and institutional performance rationales.

2023-2024 Individual At-Risk Goal 1

Design an economic development strategy around science and technology. The purpose of this would be to design tools, levers, processes that would be necessary for Arizona to move from the top of third tier as determined by the Milken institute to the bottom of the first tier. This would include active engagement and role of tech transfer. The strategic pathways document will be the product.

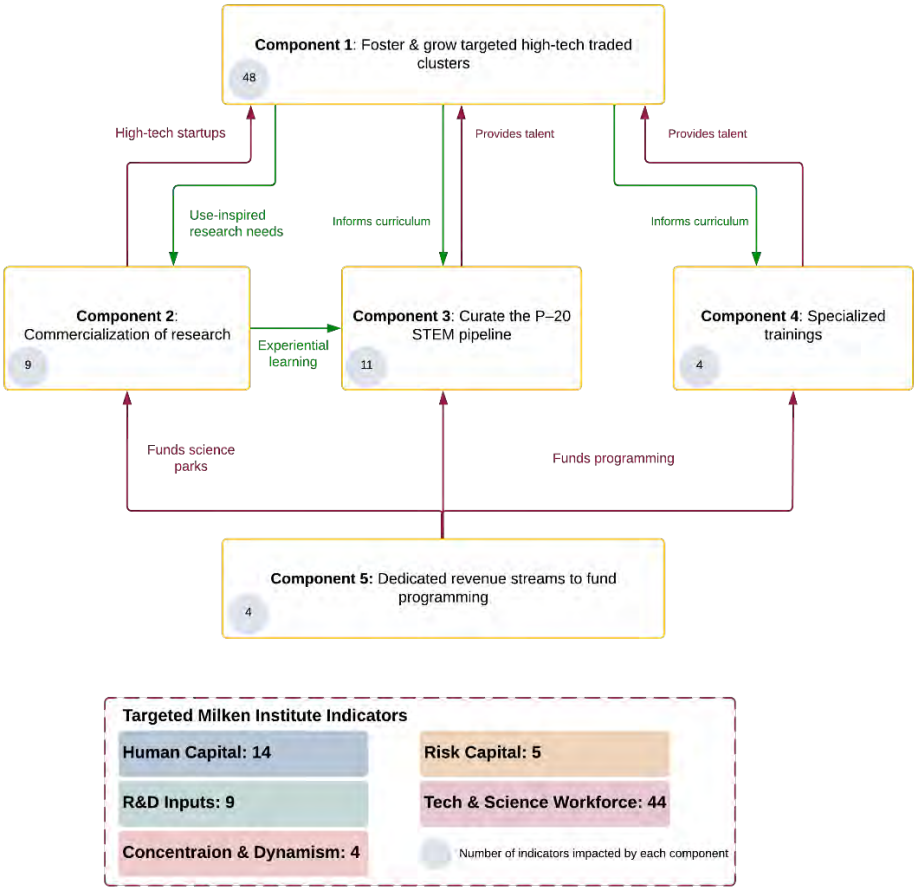
Goal Accomplished

Economic Development Strategy Around Science and Technology

This economic development strategy aims to establish a set of high-tech traded clusters as the primary drivers of growth within Arizona's economy. These clusters are concentrations of economic actors that produce similar high-tech products and services that bring to a region money that would otherwise not exist. This is accomplished through the identification of the structural needs of the cluster, informing the design of human capital development and use-inspired research pathways. These pathways are made possible by the establishment of new revenue streams funding P–20 initiatives, workforce programs, and R&D campaigns.

The figure below presents a model of the five components incorporating this strategy. Described under each component is a corresponding set of policy actions. Additionally, each component impacts several indicators from the Milken Institute's 2022 State Technology and Science Index (STSI) report that are targeted to move Arizona from the third tier of the rankings to the first tier.[1] A discussion of this proposed economic development strategy is provided in Appendix A. Details about the STSI indicators targeted by this strategy are included in Appendix B.

Model of High-Tech Economic Development Strategy



[1] Kesteven, Song, Choi, and Cheng, 2022

Component 1: Develop coalition-led strategies to foster and grow targeted high-tech traded clusters.

1.1. A working group consisting of economic, academic, political, and industry thought leaders identifies a set of high-tech traded clusters.
1.2. Coalitions of stakeholders form meta-organizations to determine the unique needs of the targeted clusters relating to human capital, knowledge base, and infrastructure.
1.3. Strategies for Arizona public university-led place-based innovation, such as industrial science parks, are established for each cluster to create spillover effects involving education, R&D, tech transfer, commercialization, and entrepreneurship.

Component 2: Increase the commercialization of research by expanding use-inspired research and introducing venture studios and a state venture fund.

2.1. Arizona public universities incorporate the knowledge-based needs of the clusters identified in Component 1 into their research strategies.
2.2. Students are integrated into subsequent use-inspired research projects through academic programming, campus employment, and other opportunities.
2.3. Arizona public university-led venture studios are established, and a state venture fund is formed, to provide guidance and seed funding for high-tech, research-driven startups.

Component 3: Curate the P–20 STEM pipeline to provide all students with the skills and experiences needed to succeed in the targeted high-tech traded clusters.

3.1. Education leaders assess and adjust curriculum standards and design at the P–12 and post-secondary levels to ensure that the human capital needs identified in Component 1 are being addressed.
3.2. The Arizona Department of Education supports local education agencies (LEAs) with the implementation and administration of these designs.
3.3. Internet connectivity for P–12 households is bolstered by Affordable Connectivity Program gap funding along with device lending and digital literacy resources provided through LEAs.

Component 4: Forge lifelong learning pathways to high-tech clusters through specialized training offerings and formal degree programs.

4.1. Post-secondary education leaders collaborate with meta-organizations to create low-cost, easily accessible, specialized workforce training programs and adjust existing foundational trainings to meet the human capital needs identified in Component 1.
4.2. Arizona public universities establish transfer pathways enabling participants to easily transition workforce development training credentials into admission and credits for formal STEM degree programs.
4.3. Universities collaborate with meta-organizations to make tuition coverage benefit programs for STEM degrees widely available to private organizations in Arizona.

Component 5: Establish dedicated revenue streams to fund P–12 and higher education science and technology initiatives.

5.1. To enable the long-term investments required to enact the policy actions presented in components 1–4, dedicated revenue streams must be established by the state. Such revenues will be used by public P–12 and higher education institutions to design, implement, and administer these actions and for Arizona public universities to lead coalition efforts.

Appendix A: Discussion of Economic Strategy

The proposed economic development strategy around science and technology is to establish a set of high-tech traded clusters as the primary drivers of growth within Arizona's economy. Two key dimensions of cultivating these high-tech traded clusters are the vitality of industries and the skills and knowledge of the labor force. These dimensions are supported throughout the five proposed components of this strategy and the corresponding set of policy actions.

Seventy-six indicators from the Milken Institute's 2022 State Technology and Science Index (STSI) rankings were identified as critical to accomplish the objective of improving Arizona's STSI ranking from Tier 3 to Tier 1 (see Appendix B for the list of targeted indicators). The impacts made by the five components are tied to the targeted STSI indicators. The specific policy actions composing each component were informed through theory and best practices identified in the literature and recommendations set forth by individual and organizational thought leaders in Arizona, spanning economic, academic, and political expertise.

Broad Strategy

Endogenous Growth Theory

The endogenous growth theory, which informed the broad strategy of this report, proposes that internal processes such as human capital, innovation, and investment capital are directly linked to a society's continuous prosperity. The key pillars of endogenous growth theory include:

- Innovation is not a random variable but is instead subject to clustering in systems.[2]
- Public and private actors co-create economic development.[3]
- Skills are developed from the investment process. It is necessary to ensure that all investments, especially public-private partnerships, increase—rather than decrease—the incentives of private companies to invest in human capital formation, and other long-term areas like R&D.[4]
- Innovation needs appropriate types of finance and is a product of the entrepreneur.[5]
- The steady state of research is influenced by several factors: a lower preference for immediate consumption, a larger labor supply, a higher probability of successful innovations, and greater productivity in the R&D process.[6]

High-Tech Traded Clusters

High-tech traded clusters are the proposed main drivers for the development of Arizona's science and technology economy.[7] High-tech traded clusters can be characterized as clusters of high-tech industries that bring in money that would otherwise not exist within a region through the concentration of successful organizations and their corresponding production of products and services.[8] High-tech traded clusters benefit from shared local inputs, the flow of technical

[2] Mazzucato & Perez, 2016
[3] Mazzucato, 2021
[4] Mazzucato & Perez, 2016
[5] Mazzucato & Wray, 2015
[6] Alcouffe & Kuhn, 2004
[7] Hoffman & Rex, 2023b
[8] Hoffman & Rex, 2023a

knowledge, mobility between employers,[9] a specialized labor pool, knowledge spillovers, various forms of innovation, and overall tech talent.[10] Such is the case in Chicago, where its regional economy encompasses various traded clusters such as freight, metals and machinery manufacturing, biopharmaceutical, and business services.[11]

Research supports the idea that technology transfer and human capital development have a positive correlation with the growth and success of traded clusters.[12] Literature also supports the relationship between knowledge spillovers and technological innovation transfers as drivers of industrial upgrade.[13] Investment in human capital provides a solution to the gap between the skills demanded by specialized traded clusters and the skills currently used by the workforce.[14]

Traded Clusters in Arizona

Arizona fares below the national average on several metrics utilized to evaluate the strength of a state's traded clusters: the share of total employment, the share of aggregate earnings, per capita employment, average earnings adjusted for the cost of living, and per capita aggregate earnings adjusted for the cost of living.[15] There are six proposed traded clusters in which Arizona—if developed and funded—can become a competitive player in a high-tech national economy. These notable traded clusters are listed in Table A1.

Table A1: Notable Traded Clusters in Arizona[16]

Traded Cluster	Examples of Companies
Aerospace vehicles and defense	Boeing, Lockheed Martin, and Raytheon
Biopharmaceuticals	Pfizer, Moderna, and Gilead Sciences
Business services	Goldman Sachs, PG&E Corp., and Sotheby's
Communication equipment and services	CISCO Systems and Motorola Solutions
Education and knowledge creation	ASU, UA, NAU, and edtech companies
Information technology and analytical instruments	Thermo Fisher Scientific and Shimadzu

Component 1: Determine Targeted High-Tech Clusters

Component 1 aims to develop and foster high-tech traded clusters by utilizing coalition-led strategies that will inform the development of human capital and use-inspired research. An example of a high-tech cluster economy is Houston, which has a similar potential cluster count

[9] Roberts & Wolf, 2018
[10] Harvard Business School, n.d.
[11] Chicago Metropolitan Agency for Planning, n.d.
[12] Hoffman & Rex, 2023
[13] Xu et al., 2022
[14] Bolter & Robey, 2020
[15] Hoffman & Rex, 2023b
[16] Hoffman & Rex, 2023a

to that of the Phoenix Metro Area.[17] Houston provides investments targeted to the local needs of industries relating to innovation, venture capital, commercialization of research, and infrastructure. These investments have been critical to Houston's rising prominence as a technology-driven economy.[18]

Component 1.1: Establishment of Statewide Economic Strategy

Component 1.1 is the establishment of a broad statewide economic strategy that will define the high-tech traded clusters that will be targeted for development. The importance of a statewide framework is demonstrated by research indicating that, while clusters can develop organically, purposeful and collaborative planning leads to stronger and more timely growth.[19] A critical part of this economic strategy is the creation of a working group composed of economic, academic, political, and industry thought leaders. Their purpose will be to identify the high-tech traded clusters that are well situated for the level of growth required to transform Arizona's economy.

Component 1.2: Creating a Meta-Organization for Each Targeted Cluster

After determining the high-tech traded clusters that will be targeted, Component 1.2 calls for a coalition of stakeholders to form a meta-organization for each cluster. These meta-organizations will be tasked to identify and coordinate the actions needed to grow the targeted clusters. Meta-organizations are complex, dynamic groupings of organizations that manage collective efforts and promote overall interests without formal authority over cluster members.[20] They provide flexibility in direction and vision due to varied technical knowledge and experiences within industries as well as the autonomy that allows members to adapt industry standards and practices to align with the goals of the managing body.[21] Examples of meta-organizations include the Arizona Advanced Technology Network,[22] Arizona Technology Council,[23]and Partnership for Economic Innovation.[24] The collaborative efforts of these meta-organizations with one another as well as other key actors of the state's economy will support discussion and decision-making efforts. With the expertise of the members that will be comprised of these meta-organizations, innovative ideas and projects can come to development and be supported from other economic actors.

Component 1.3: Utilize Place-Based Initiatives (PBI)

Lastly, Component 1.3 utilizes place-based initiatives (PBI) to foster collaboration and provide resources that support high-tech traded clusters. PBIs promote collaboration by improving local commodities through a combination of a region's political, economic, and social actors and resources.[25] Using PBI as a framework, the creation of science parks enables the gathering of small and medium enterprises within a targeted cluster at dedicated physical locations.[26] Spillover effects, including collaboration within and around science parks, lead to increased productivity and access to valuable resources and conditions like skilled labor, specialized

[17] Zandiatashbar & Hamidi, 2022
[18] Tatum, 2023
[19] Crawley, 2020
[20] Lupova-Henry & Dotti, 2022
[21] Berkowitz et al., 2022
[22] Arizona Commerce Authority, n.d.a
[23] Arizona Technology Council, 2024
[24] Partnership for Economic Innovation, n.d.
[25] Morrison & Doussineau, 2019
[26] Puig & Urzelai, 2019

providers, and a supportive market environment, further fostering innovation and growth within the sector.[27] The successful impact on innovation of the science park design is demonstrated through ASU's Fulton Schools of Engineering Research Parks. Research Parks provides core research facilities, a solar fabrication facility, and overall R&D capabilities and production. MacroTechnolgy has invested $14.3 million in semiconductor equipment and research thrusts.[28] Other successful science parks include North Carolina's Research Triangle Park,[29] Alabama's Huntsville Cummings Research Park,[30] and Wisconsin's Madison University Research Park.

Arizona Landscape

The success of Arizona's semiconductor industry highlights the ability of a high-tech traded cluster to thrive within the state through investments in resources and infrastructure and the collaborative efforts of industry actors. Since 2020, through the relocation and expansion of thirty-five semiconductor companies, Arizona's economy is poised to receive $65 billion in investments from the semiconductor industry alone.[31] These investments and efforts to strengthen the semiconductor cluster are lauded as successes by various prominent state actors such as the Arizona Chamber of Commerce and the Greater Economic Phoenix Council.

In addition to the success of Arizona's semiconductor industry, key Arizona economic actors have voiced support for actionable goals to pursue the fostering of high-tech traded clusters. These action items are listed in Table A2.

Table A2: Arizona Economic Actors and Sentiments of Support

AZ Economic Actors	Action Items
Arizona Chamber of Commerce[32]	● Capital formation and investment ● Open new markets for Arizona businesses ● Collaboration of state and regional economic development entities ● Support of statewide broadband expansion ● Modernization of infrastructure
Greater Phoenix Economic Council	● Creation of public-private partnerships to drive innovation[33] ● Improvement of access to venture capital[34] ● Generation of new venture funding opportunities[35]

[27] Puig & Urzelai, 2019
[28] ASU Ira A. Fulton Schools of Engineering, n.d.
[29] National Research Council, 2013
[30] Cummings Research Park, n.d.
[31] Vanek, 2024
[32] Arizona Chamber of Commerce, 2024
[33] Greater Phoenix Economic Council, 2023b
[34] Greater Phoenix Economic Council, 2023a
[35] Greater Phoenix Economic Council, 2022

AZ Economic Actors	Action Items
	● Investment in opportunities for upskilling[36]
Sun Corridor Inc.[37]	● Utilize Arizona's advantage in the talent, infrastructure, business environment, and healthcare industries
Arizona Commerce Authority[38]	● Address the educational attainment barrier facing the Arizona workforce and its effect on the state's economic development
Arizona Technology Council[39]	● Creation of economic development tools through innovation, business attraction, retention, and growth
Productivity and Prosperity Project (P3)-based in ASU's W.P. Carey School of Business[40]	● Innovative activity and interaction between economic actors ● Attract new businesses through cluster formation ● Innovation through the transfer of tacit knowledge

Component 2: Commercialization of Use-Inspired Research and the Creation of New Venture Capital Funding

Component 2 aims to increase the commercialization of research by expanding use-inspired research initiatives in public universities with an emphasis on student integration and experiential learning. Additionally, new venture capital management and funding vehicles are created to fuel the commercialization of use-inspired research, which lends itself to scalable industry applications. The introduction of venture studios and state venture funds will create new pathways around existing bottlenecks, providing new opportunities for high-tech startups.

Component 2.1: Public Universities Incorporation of Knowledge-Based Needs into Research Strategies

Component 2.1 aims to incorporate the knowledge-based needs of the targeted clusters into the research strategies of public universities. Historically, universities have utilized their human capital and infrastructure resources to produce basic research, yet such basic, uncoordinated research output is insufficient to develop high-tech clusters due to their limited application opportunities.[41] Long-term relationships, two-way communication linkages, and long-term

[36] Greater Phoenix Economic Council, 2021
[37] Sun Corridor Inc., 2014
[38] Rounds Consulting Group, Inc., 2022
[39] The Arizona Technology Council, 2024
[40] Hill et al., 2024
[41] Crawley, 2020

support allow for a more widespread sharing of information.[42] Collaborative research planning with economic entities extends the reach of public universities to go beyond academic applications. Research goals need to adapt towards producing use-inspired research that can ultimately lead to commercialization and advance the growth of the targeted clusters..

Component 2.2.: Student Integration in Use-Inspired Research Projects

Component 2.2 involves incorporating students into use-inspired research endeavors through various opportunities, such as academic programming and campus employment, to train future high-skilled workers in tech transfer. This exposure to use-inspired projects and tech transfer prepares students to be future leaders in high-tech cluster commercialization efforts through strategies involving interdisciplinary efforts and emerging thought.[43] ASU's Luminosity Lab exemplifies this used-inspired, student-centric research and development paradigm. The Luminosity Lab tackles large-scale projects across multiple sectors such as healthcare, education, energy, and sustainability.[44] Examples of Luminosity Lab's use-inspired research projects include NASA's Charlotte rover, XPRIZE Next-Gen Mask Challenge winner for the design of a fog-free N-95 mask,[45] and robotic telehealth for rural communities.

Component 2.3: Establishing Arizona Public University-Led Venture Studios and State Venture Funds

Component 2.3 addresses the barrier of organizational and financial support through the creation of venture studios with seed funding provided by a dedicated state venture fund for high-tech, research-driven startups. This entrepreneurial aid is in dire need due to the current process by which venture funding in Arizona is distributed. The traditional process of venture funding where operational revenue is a prerequisite to investment has created a bottleneck for innovation, discouraging startups that may have high-potential technologies that require more time and effort to bring to market. With the current processes to fund startups, external funding opportunities through various out-of-state venture capital vehicles have steadily moved knowledge, innovation, and talent out of Arizona.[46]

Venture studios operate by matching technologies that have commercialization potential with the most compatible entrepreneurial talent to execute those ideas. Studios then test these designs and provide funding and resources to grow scalable startups.[47] The success rates of venture studios provide testament to their capabilities in furthering funded startups—60% of all companies created in venture studios make it to Series A.[48] With the guidance and management of these venture studios, the creation of a state venture fund—similar to Utah's Capital Investment Corporation[49]—will provide much-needed seed funding high tech startups. A state venture fund can be formed using existing investment funds, such as the Arizona Endowment Trust Fund,[50] and produce returns for clients by investing in high-tech startups located in Arizona that engage in activity related to the targeted clusters. By filling funding gaps, the state venture fund will support startups that struggle to attract private investment due to

[42] Crawley, 2020
[43] Crawley, 2020
[44] ASU Luminosity Lab, n.d.
[45] Seckel, 2020
[46] Wichner, 2023
[47] Zasowski, 2022
[48] Zasowski, 2022
[49] Utah Capital Investment Corporation, 2021
[50] AZ Endowment Trust Fund, n.d.

perceived risks or insufficient traction and can keep knowledge, innovation, and talent within the state and benefit the Arizona economy.

Component 3: Curate P–20 STEM Pipeline

Component 3 seeks to curate Arizona's P–20 STEM pipeline to generate student interested in STEM and provide them with the skills and experiences required to succeed in their future careers and to meet the human capital needs of the targeted high-tech traded clusters.

Component 3.1: Assess and Adjust STEM Curriculum Standards and Design

Component 3.1 calls for education leaders to assess and adjust curriculum and programming to address the gaps in human capital identified in Component 1. With the additional funding generated from Component 5, local education agencies (LEAs) can design and implement supplemental STEM curricula and programs that foster the abilities and interests of students, with special attention paid to equity.[51] Table A3 illustrates examples of various curricula and programs designed for specific needs of clusters and industries.

The P–20 STEM pipeline can be further enhanced by post-secondary institutions reviewing program learning outcomes to ensure that graduates meet the ever-evolving needs of the targeted clusters.[52] Overall, engaging students throughout the P–20 pipeline via hands-on and experiential learning in STEM programs further enhances their interest and retention of skills, making it imperative to design programs that incorporate practical, real-world applications.[53]

Table A3: Industry Inspired Curriculum and Programs

Organization	Curriculum and Program Design
Technology Council of North Dakota (TechND) [54]	Collaboration between 40+ public and private sector organizations provide insight into workforce needs and support curriculum development for K–12 cybersecurity education standards
Project Lead the Way (PLTW) [55]	A national non-profit that collaborates with industry partners to develop curriculum that emphasizes in-demand skills and offers internship opportunities for students
Texas Essential Knowledge and Skills (TEKS) [56]	Partnership between Khan Academy and Exxon Mobil to align STEM curriculum for Texas teachers through free online modules for student and curriculum guides for teachers
Skoltech and MIT [57]	Partnership to develop *Skoltech Learning Outcomes Framework* to correspond with UNESCO's education goals

[51] Le & Robbins, 2016
[52] Verma et al., 2022
[53] Sáinz et al., 2022
[54] North Dakota Information Technology, n.d.
[55] Project Lead the Way, n.d.
[56] Khan Academy Blog, 2024
[57] Crawley, 2022

Component 3.2: ADE to Support Local LEAs with Implementation and Administration

Given the significant variance of P–12 population needs and LEA administrative capabilities, Component 3.2 recommends that the Arizona Department of Education (ADE) support LEAs with the establishment and administration of these programs. Rather than oversight, ADE will help spread best practices and successful strategies while fostering conversations between LEAs adopting similar goals or facing analogous challenges.

Component 3.3: Address Broadband Access Barriers: Affordability, Accessibility, and Digital Literacy

Component 3.3 advises that the state should provide funding to improve affordability, accessibility, and digital literacy for P–12 students. Technology access has been shown to boost students' general and academic self-efficacy and impact their engagement in STEM domains.[58] Access to internet technology is fundamental to ensuring educational equity——rural students, in particular, face significant disadvantages in internet access, affecting their ability to engage in STEM activities.[59] Programs like the Affordable Connectivity Program (ACP) [60] and Arizona's Broadband Equity Access and Deployment Program (BEAD)[61] address these disparities, but with federal funding for ACP having ended on June 1, 2024 existing affordability gaps will only widen. Many P–12 households also lack access to the devices required to engage in educational programming or lack the digital literacy to utilize such technologies to the extent required. LEAs, many of which have existing device lending or digital literacy programs, can be instrumental here. Table A4 provides additional details about the interventions that would address these barriers.

Table A4: Actions to Address Barriers to Broadband and Technology Access

Challenge	Action
Broadband access	Bolster existing Broadband Equity Access and Deployment Program efforts
Broadband affordability	Provide gap funding for the Affordable Connectivity Program until federal funding resumes
Device access	Bolster existing LEA device lending programs
Digital literacy	LEAs partner with ADE, public colleges, and the Arizona Department of Economic Security to determine and address the digital literacy needs of P–12 households.

Component 4: Forge Lifelong Learning Pathways Through Specialized Trainings

Component 4 forges lifelong learning pathways to high-tech industries and formal programs through specialized trainings. Specialized and customized workforce training programs play a critical role in the growth of high-tech clusters by providing targeted education and skill

[58] Shank & Cotten, 2014
[59] Shank & Cotten, 2014
[60] Affordable Connectivity Program, n.d.
[61] Arizona Commerce Authority, n.d.b

development that aligns with the specific needs of these industries.[62] Additionally, these programs contribute to higher wages for workers with specialized skills within the cluster, thus fostering economic growth. These lifelong learning pathways allow for sustainable knowledge and skill advancement of the workforce as new technologies emerge.

Component. 4.1: Create Low-Cost, Easily Accessible, Specialized Workforce Training Programs

A key characteristic of competitive science and technology economies is the wide availability of adaptable, specialized training programs created in partnership with industry. Attributes of effective training programs include accessibility, affordability, engaging material, credible and qualified instructors, and career support.[63] ASU's Career Catalyst program serves as an exemplar of such a training provider for both individuals and organizations. Career Catalyst provides innovative educational resources that include programs, courses, and certificates. Individuals are presented with expansive and accessible science and technology offerings (including AI foundations, microelectronics, cybersecurity, coding, and data analytics) in different learning modalities. Organizations are provided with the option to create customized programs designed to integrate with their strategic goals.

Component. 4.2: Arizona Public Universities Establish Transfer Pathways Towards Formal STEM Degree Programs.

Component 4.2 promotes the creation of accessible pathways between workforce development initiatives and formal degree programs. Providing science and technology workers with an easy transition from training programs to formal degree programs benefits industries with the knowledge concentration associated with a more educated workforce. The Texas Workforce Commission Skills Development Fund[64], the Lorain Community College mechatronics program[65], the NYS Pathways in Technology (P-TECH)[66], and California's Strong Workforce Program[67] are all examples of programs with seamless transitions from skill acquisition to formal degrees. These programs provide targeted training in high-demand fields through partnerships between educational institutions, businesses, and government agencies, ensuring that training aligns with employer needs and offers pathways to higher education programs. Funded by public and private sources, they aim to be accessible to a diverse population, helping bridge the gap between workforce development and formal education by equipping individuals with essential job skills.

Component. 4.3: Make Tuition Coverage Benefit Programs for STEM Degrees Widely Available to Private Organizations

Component 4.3 addresses two pivotal barriers associated with higher education attainment for nontraditional learners: cost and access. This policy action involves meta-organizations collaborating with universities to make tuition coverage benefit programs for STEM degrees widely available to private organizations. With the collaborative efforts of meta-organizations and higher education institutions addressing the barriers of cost and access through flexible and

[62] Illinois Department of Commerce and Economic Opportunity, 2019
[63] Lawrence, 2021
[64] Texas Workforce Commission, n.d.
[65] Soliz, 2016
[66] Soliz, 2016
[67] California Community Colleges, n.d.

affordable programs, companies can enhance their recruitment efforts and increase employee engagement, benefiting both the organization and its employees. Partnerships similar to the Starbucks College Achievement Plan (SCAP) at ASU can create new pathways to higher education degree attainment. Starbucks has 13,000 employees enrolled in ASU Online classes through SCAP at no cost to the employee. Many SCAP participants were overall more likely to remain at Starbucks longer than similar non-SCAP participants and experience high-pay and high-mobility roles shortly after graduation.[68]

Component 5: Create Dedicated Revenue Streams to Fund STEM Programming

Component 5 establishes dedicated revenue streams to fund the public P–20 science and technology initiatives laid forth in this report. Without dedicated, sufficient, and sustainable funding sources, the aforementioned components critical for Arizona's transformation into a top-tier science and technology economy will not be possible.

Although significant state investments will be required to establish the policy actions within the four other components, such funding will not be the sole source of income as the effects of these components come to fruition. The successful implementations of these components are poised to attract external funding streams such as research grants, venture capital, and revenue generated by traded clusters.

The creation and utilization of the Technology and Research Initiative Fund (TRIF) exemplifies the importance of a dedicated revenue stream to the advancement of knowledge and innovation. TRIF has provided $1.7 billion in revenues to universities since its establishment in 2001[69] and has funded projects that have resulted in improvements in healthcare, water, environmental, and energy solutions, advancements in national security systems, space exploration and optical solutions, and higher education access for workforce development.[70] Table A5 describes several of the advancements made from FY22–24.

Table A5: Advancements Made Possible Through TRIF for FY22–24

Area of innovation	ASU[71]	NAU[72]	UA[73]
Access and workforce development	Luminosity Lab, Research Parks, and Advances Materials Initiative	Workforce training, lifelong learning, student service and support, and continuing support for existing access and workforce development programs	Office of Social Impacts
Improving health	Biodesign Institute, Institute for the Future of	Pathogen genomics, community health research,	BIO5 Institute

[68] Burning Glass Institute, 2023
[69] Arizona Board of Regents, 2023
[70] Arizona Board of Regents, 2018
[71] Arizona Board of Regents, n.d.a
[72] Arizona Board of Regents, n.d.b
[73] Arizona Board of Regents, n.d.c

Area of innovation	ASU[71]	NAU[72]	UA[73]
	Health, and Arizona Wellbeing Commons	and bioengineering/ biotechnology	
National security systems	Global Security Initiative	Cybersecurity and innovative materials and supply chain management	Research development
Space exploration and optical sciences	NewSpace and Interplanetary Initiative	Solar system science and exoplanets	UArizona Space Institute
Water, energy, and environmental systems	Global Futures Lab, LightWorks, and Future H20	Forest health and land management and adapting to a changing environment	Arizona Institutes for Resilience

Universities have achieved significant science and technology feats through TRIF. Table A6 provides a list of achievements enabled by TRIF in FY 2023 alone.

Table A6: FY 2023 Achievements Enabled Through TRIF

University	List of achievements
ASU	• $90.8 million award to build the world's first compact X-ray free electron laser • Largest NSF award to date to support the construction of a room-sized instrument to explore complex matter • The investment of $270 million to create the Materials-to-Fab (MTF) Center • Launch of ASU's LunaH-Map CubeSat aboard NASA's Artemis I lunar mission
NAU	• Developed new technologies in cybersecurity and cyber solutions • Degree and certificate programs tailored to regional business needs and occupational trends • SPACE initiative prepares workforce to contribute to astronomical research
UA	• $266 million in new sponsored projects funding • Secured significant investment from ACA to erect semiconductor and VR infrastructure • Creation and license of drug treatment for vascular dementia

Appendix B: Targeted Milken Institute STSI Indicators

The indicators listed in Tables B1–B5 were identified as critical to accomplishing the objective of improving Arizona's STSI ranking from Tier 3 to Tier 1. When compared to other states for each of these 76 indicators, Arizona's ranking comes in as lower than 7th, the position that the state must average across the five subindexes that compose the STSI to move to the lowest position in Tier 1. The five components described in this strategy each impact a portion of these 76 indicators. The tables in this section provide details on Arizona's ranking and value for each indicator along with that of the state currently ranked #7.

The subindexes that compose the STSI are defined as:

- HCI—Human Capital Investment
- RCI—Risk Capital and Entrepreneurial Infrastructure
- RDI—Research and Development Inputs
- TCD—Technology Concentration and Dynamism
- TSW—Technology and Science Workforce

Table B1: STSI Indicators Impacted by Component 1 (Foster and Grow High-Tech Traded Clusters)

Subindex	Indicator	AZ Ranking	AZ Value	State #7	State #7 Value
RDI	R&D Expenditures on Physical Sciences per Capita	10	$35.815	California	$37.770
RDI	R&D Expenditures on Engineering per Capita	25	$26.26	Colorado	$44.54
RDI	R&D Expenditures on Life Sciences per Capita	39	$114.91	Vermont	$315.42
RDI	R&D Expenditures on Math and Statistics per Capita	33	$1.24	Pennsylvania	$3.71
TSW	Aerospace Engineers per 100,000 workers	11	54.9	New Mexico	92
TSW	Chemical Engineers per 100,000 workers	46	3.9	Idaho	28.6
TSW	Chemical Technicians per 100,000 workers	47	17.2	Alabama	70.9
TSW	Chemists per 100,000 workers	50	17.9	Michigan	88
TSW	Nuclear Engineers per 100,000 workers	34	0	Maine	19.3

Subindex	Indicator	AZ Ranking	AZ Value	State #7	State #7 Value
TSW	Nuclear Technicians per 100,000 workers	21	0	South Carolina	6.1
TSW	Environmental Engineers per 100,000 workers	18	39.9	Colorado	51
TSW	Environmental Science and Protection Technicians per 100,000 workers	14	25.4	California	35.4
TSW	Physicist per 100,000 workers	36	2.2	California	16.9
TSW	Atmospheric and Space Scientists per 100,000 workers	33	4.1	South Dakota	17.8
TSW	Civil Engineers per 100,000 workers	36	173.3	North Dakota	311.2
TSW	Electrical Engineers per 100,000 workers	10	179.8	Vermont	195.1
TSW	Materials Scientists per 100,000 workers	25	3.1	Maryland	8.5
TSW	Mechanical Engineers per 100,000 workers	23	189	South Carolina	281.8
TSW	Industrial Engineers per 100,000 workers	20	203.6	South Carolina	340
TSW	Materials Engineers per 100,000 workers	26	14.7	Pennsylvania	26
TSW	Mining and Geological Engineers per 100,000 workers	7	18	--	--
TSW	Computer Hardware Engineers per 100,000 workers	23	24.3	Montana	67.8
TSW	Information Research Scientists (Computer and Information Research Scientists) per 100,000 workers	26	8.4	California	45.1
TSW	Petroleum Engineers per 100,000 workers	31	0	Colorado	49

Subindex	Indicator	AZ Ranking	AZ Value	State #7	State #7 Value
TSW	Other Types of Engineers per 100,000 workers	33	61.4	Georgia	157.9
TSW	Geoscientists per 100,000 workers	28	12.1	Nevada	44
TSW	Operations Research Analysts per 100,000 workers	21	62.4	Ohio	84.7
TSW	Statistician per 100,000 workers	27	16.8	Arkansas	37
TSW	Bioengineers and Biomedical Engineers per 100,000 workers	17	10.9	Vermont	23.2
TSW	Soil and Plant Scientists per 100,000 workers	30	6.7	Oregon	29.1
TSW	Biochemists and Biophysicist per 100,000 workers	37	2.6	Maryland	57.9
TSW	Microbiologist per 100,000 workers	46	2.1	Vermont	20.7
TSW	Zoologists and Wildlife Biologists per 100,000 workers	21	12.9	Maine	42.1
TSW	Medical Scientists per 100,000 workers	30	45.8	Minnesota	110.6
TSW	Epidemiologists per 100,000 workers	14	6	Massachusetts	10.4
TSW	Agricultural and Food Science Technicians per 100,000 workers	27	8.6	North Dakota	34.7
TSW	Biological Technicians per 100,000 workers	33	37.9	Washington	113.5
TSW	Other Types of Life Scientists and Physical Scientists (Life, Physical, and Social Science Technicians, All Other) per 100,000 workers	43	18.8	Oregon	59.3
TSW	Computer Systems Analysts per 100,000 workers	17	405.3	Delaware	497

Subindex	Indicator	AZ Ranking	AZ Value	State #7	State #7 Value
TSW	Information Security Analysts per 100,000 workers	7	136.2	--	--
TSW	User Support Specialists (Computer User Support Specialists) per 100,000 workers	2	664.3	Massachusetts	526.7
TSW	Network Architects (Computer Network Architects) per 100,000 workers	8	129.7	Georgia	141.8
TSW	Systems Administrators (Network and Computer Systems Administrators) per 100,000 workers	21	237.6	Alaska	306.9
TSW	Database Administrators (+ Architects) per 100,000 workers	22	76.7	Oklahoma	109.7
TSW	Computer Programmers per 100,000 workers	37	89.2	New Hampshire	176.9
TSW	Software Developers (+ Software Quality Assurance Analysts and Testers) per 100,000 workers	11	1,134.70	New Jersey	1,246.40
TSW	Web Developers (+Digital Interface Designers) per 100,000 workers	13	90.8	New York	122.6
TSW	Other Types of Computer & Information Scientists (Computer Occupations, All Other) per 100,000 workers	21	201	Washington	374.6

Table B2: STSI Indicators Impacted by Component 2 (Commercialization of Research)

Subindex	Indicator	AZ Ranking	AZ Value	State #7	State #7 Value
RCI	Competitive NSF Proposal Funding Rate	26	26.30%	Colorado	31.30%

Subindex	Indicator	AZ Ranking	AZ Value	State #7	State #7 Value
RCI	Average VC Investment in Nanotechnology as Percent of GSP	9	0.0035%	Louisiana	0.0039%
RCI	SBIC Funds Disbursed per $1,000 of GSP	13	$0.30	Connecticut	$0.38
RCI	Deal Growth of VC Investment	39	21.57%	Connecticut	50.15%
RCI	Total Venture Capital Investment Growth	39	59%	Delaware	150%
RCI	Business Starts per 100,000 People	45	4,091.26	Colorado	6,068.79
RDI	National Science Foundation Funding per $100,000 of GSP	16	$31.370	Wyoming	$60.670
RDI	Average Annual Number of STTR Awards per 10,000 Business Establishments (Phase 1)	11	0.58	Colorado	0.74
RDI	Average Annual Number of SBIR Awards per 10,000 Business Establishments (Phase 1)	17	2.27	Delaware	3.97

Table B3: STSI Indicators Impacted by Component 3 (Curate the P–20 STEM Pipeline)

Subindex	Indicator	AZ Ranking	AZ Value	State #7	State #7 Value
HCI	Percentage of Households with Computers	17	89.93%	California	91.62%
HCI	Percentage of Households with Broadband Access	16	81.20%	Massachusetts	84.00%
HCI	Recent Bachelor's Degree in Science and Engineering per 100,000 People	26	113.75	New Hampshire	153.07
HCI	Recent Degrees in Science and Engineering per 100,000 People	29	166.21	Vermont	235.37

Subindex	Indicator	AZ Ranking	AZ Value	State #7	State #7 Value
HCI	Percentage of Bachelor's Degrees in Science and Engineering per 100,000 People	41	0.20%	Delaware	1.60%
HCI	Average Evidence-Based Reading and Writing SAT Scores	19	577	Kansas and Wisconsin	618
HCI	Percentage of Population w/ Bachelor's Degrees or Higher	33	18.71%	Virginia	25.70%
HCI	Percentage of Population w/ Advanced Degrees	28	7.03%	New Jersey	10.40%
HCI	Doctoral Engineers per 100,000 people	15	48.77	Virginia	69.12
HCI	Recent PhD Degree in Science and Engineering per 100,000 People	37	17.51	Maryland	31.71
HCI	Doctoral Scientists per 100,000 people	40	124.34	Colorado	256.13

Table B4: STSI Indicators Impacted by Component 4 (Lifelong Learning)

Subindex	Indicator	AZ Ranking	AZ Value	State #7	State #7 Value
TCD	Percent of Establishments in High-Tech NAICS Codes	13	3.09%	Utah	3.48%
TCD	Number of Inc. 500 Companies per 10,000 Establishments	11	0.35	Nevada	0.42
TCD	Net Formation of High-Tech Establishments per 10,000 Establishments	28	42.29	Colorado	54.28
TCD	Average Yearly Employment Growth of High-Tech Industries	33	0.0024	Rhode Island	0.0051

Table B5: STSI Indicators Impacted by Component 5 (Dedicated Revenue Streams to Fund Programming)

Subindex	Indicator	AZ Ranking	AZ Value	State #7	State #7 Value
HCI	State Appropriations for Higher Education (per capita)	35	$252.31	Alaska	$466.48
HCI	Percent Change in State Appropriations for Higher Education	27	3.20%	Utah	7.57%
HCI	Per Capita State Spending on Student Aid	47	$5.56	West Virginia	$68.81
RDI	Academic R&D Dollars per Capita	33	$198.72	New Hampshire	$348.99

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2023-2024 Individual At-Risk Goal 2

Design and launch an all industry training center around all sectors and activities surrounding the semi-conductor industry in Arizona. This would include semiconductors, advanced battery technology, other high-tech computation and systems and artificial intelligence. Build the Learning Enterprise training programs, the advanced digital learning for enhanced and accelerated workforce development drawing from ASU content. The measurement of success is the design and the launch of this special digital training center across the sectors with industrial participation in each and every aspect.

Goal Accomplished

Microelectronics Workforce Development Training Center
July 2024

Executive Summary

Arizona State University joins forces with industry and government leaders as a national resource in creating, preparing and inspiring the American microelectronics workforce of the future. With respect to the ASU Enterprise's strategic plan, ASU's commitment to excellence in microelectronics education and research is unwavering. In FY24, ASU offered over 100 opportunities to learners and secured over $300M in newly committed investments over the next few years. This report on the Microelectronics Workforce Development Training Center outlines the university's commitment to upskilling today's workforce, training tomorrow's workforce and inspiring the future workforce.

Microelectronics Workforce Development Hub

Arizona is one of the nation's key centers of microelectronics activity — home to some of the leading semiconductor producers and supply chain operators, major defense contractors, universities and research institutes, and a vibrant start-up community.

The CHIPS and Science Act's historic investment of more than $52 billion to catalyze American semiconductor manufacturing underscores a national commitment to this sector. This strategic move is set to expand the microelectronics workforce significantly. Arizona is at the forefront of this expansion, expecting more than 20,000 new microelectronics manufacturing jobs in the state and receiving more than $100 billion in private investment in the semiconductor industry since 2021. Yet, a gap in the skilled workforce required to fuel this growth remains.

Arizona State University (ASU) is collaborating with industry and government leaders to create, prepare and inspire the American microelectronics workforce of the future. In October 2023, ASU rapidly expanded its educational offerings for learners and career professionals through its new microelectronics workforce development training center, called the **Microelectronics Workforce Development Hub**. The center's educational portfolio prepares learners at all ages and stages with programs that help them enter the field, elevate to mid-level positions or prepare for advanced positions across three domains:

- **Upskilling today's workforce.** ASU's learning solutions range from technical training to leadership offerings designed to equip professionals with global mindsets and cross-cultural skills. Course content is continually updated and expanded to ensure that programs address the evolving opportunities and challenges in the semiconductor workforce and meet the needs of businesses.

- **Training tomorrow's workforce.** ASU offers a variety of programs that fast-track engineering and technician training, serving learners already in the industry as well as those who aspire to join it.

- **Inspiring the future workforce.** ASU provides a network of K-12 learning programs to grow awareness of semiconductor-related fields, creating more pathways to higher education and opportunity.

The Microelectronics Workforce Development Hub and related activities also spur the state's economic development by attracting new companies to Arizona, encouraging existing companies to expand their presence here and making ASU and Arizona more competitive for funding from the Department of Defense, Department of Commerce, National Science Foundation and other large-scale federal initiatives created by the CHIPS and Science Act. This local industry expansion encourages industry participation in each and every aspect of the ASU training center as outlined below.

To support these efforts, ASU has also increased its human capital related to semiconductor workforce training, including hiring a Professor of Practice and project manager. ASU is also recruiting a program coordinator and partnership engagement lead to advance the goals of the hub. This team augments the existing capability within ASU's Ira A. Fulton Schools of Engineering to create and deliver workforce development programs and career services. This existing capability includes over 20 current faculty members directly involved in supporting emerging technologies as a portion of their portfolio.

Upskilling Today's Workforce

Stackable Microcredentials

The Fulton Schools of Engineering introduced new stackable microcredentials in FY24 that address the urgent demand for adaptable upskilling and reskilling across engineering and technology fields, particularly in microelectronics.

Stackable microcredentials enable individuals to stay competitive in today's job market by responding swiftly to industry demands through relevant skill development opportunities. By breaking learning into modular units, ASU makes professional development financially feasible, aligning with the evolving needs of employers.

Through this program, learners earn badges and microbadges that represent their proficiency and achievement. Individuals can earn a microbadge by successfully completing a single course and earn a badge by taking a recommended series of courses.

Sample badges include:

- Deep Learning with TensorFlow
- Microcontroller Applications: Programming and Electrical Basics to Integration
- Modeling and Control of Industrial Robots
- Semiconductor Packaging, Materials, Manufacturing, Assembly, Test, and Reliability
- Semiconductor Packaging: Fundamental Concepts and Drivers

Microelectronic Specializations

The Fulton Schools of Engineering developed a series of online training courses, providing learners with in-demand skills and credentials needed for a career in microelectronics. These non-credit, on-demand courses, are designed to provide participants with the engineering skills and knowledge essential for microelectronics. Learners may choose a foundational area of focus, such as materials science, build a skill like rapid prototyping, or explore specific innovations in sub-fields like additive manufacturing, battery technologies and semiconductor packaging.

Sample programs include:

- Additive Manufacturing Processes
- Battery Technologies
- Design of Engineering Experiments
- Materials Science for Technological Applications
- Rapid Prototyping and Tooling
- Rapid Prototyping Using 3D Printing
- Semiconductor Characterization

Professional Skills Training

Employers recognize the crucial need to enhance the skills of their workforce. ASU CareerCatalyst fills this need through workforce education solutions designed to increase engagement, creativity and productivity for learners, while aligning learning programs to employers' business strategies and workforce needs.

CareerCatalyst offers an integrated portfolio of job-relevant education for in-demand roles. As of FY24, ASU CareerCatalyst offers more than 250 courses and programs, with many pertaining to microelectronics, such as:

- Additive Manufacturing
- Materials Science for Advanced Technological Applications
- Rapid Prototyping Using 3D Printing
- Designing Antifragile Microelectronics Supply Chains

While technical skills are essential in these dynamic fields, what sets top professionals apart is the ability to adapt, collaborate creatively and engage with emotional intelligence. These “soft” or professional skills are crucial for navigating the complexities and rapid changes typical in technology-driven industries.

As of FY24, CareerCatalyst offers a suite of training that includes:

- English for the Semiconductor Industry
- Professional Skills for Everyone series, a portfolio of 28 on-demand courses that teach professional skills in areas like communication, collaboration, strategic thinking and decision-making.

To date, the microelectronics portfolio has served over 20,000 learners from more than 90 countries.

Training Tomorrow’s Workforce

Degree Pathways

Whether students are pursuing a degree, looking to level up their skills in the workforce, or seeking a pathway into microelectronics, ASU now offers a wide array of academic programs to help learners from diverse backgrounds. These programs were developed based on guidance from industry partners to address their needs as well as those of the industry as a whole. As of FY24, microelectronics-related university offerings include:

- 19 bachelor’s degrees
- 3 undergraduate minors
- 9 microelectronics specializations
- 18 master’s degrees
- 9 doctoral degrees
- 17 certificate programs
- 26 microbadges leading to 7 badges
- 4 industry certifications

Inspiring the Future Workforce

K-12 Learners

ASU’s K-12 Microelectronics Discovery Offerings are crafted to spark awareness and interest in microelectronics and ignite a passion for innovation and technology among early learners, laying the foundation for a skilled future workforce.

Among these offerings is ASU Preparatory Academy, an innovative, tuition-free public charter school network serving students from pre-K through high school. More than 250,000 students have enrolled in this digitally enhanced learning environment that offers more than 200 interdisciplinary pathways, including specialized courses in electronics. ASU Prep's approach ensures students are both academically prepared and industry-ready for the microelectronics sector, providing a seamless, affordable pathway to college degrees and careers in this essential field.

Convening Industry Partners and Academic Experts

Launched in August 2022, ASU's Microelectronics Industry Council fosters leadership, advocacy and collaboration among diverse high-tech enterprises, including multiple microelectronics industry leaders. Convening industry partners and academic experts, the Industry Council proactively addresses the workforce, technology and resource challenges facing companies at the forefront of the microelectronics resurgence in Arizona and across the U.S.

Through the council, ASU and a growing network of high-tech companies are collaborating to align expertise, resources, human capital and infrastructure to bring companies the results they need and provide a future of sustained prosperity for Arizona.

The Industry Council connects partners to the university's depth and breadth of academic expertise in materials and devices, circuits, systems, architecture and advanced packaging integration. ASU is the largest provider of engineers for Intel and the largest provider of U.S. engineers for Taiwan Semiconductor Manufacturing Company (TSMC), and is working closely with other Industry Council members such as Applied Materials and Microchip to accelerate domestic manufacturing, research and development, and workforce development. The Industry Council served as key advisors on partnerships and grant proposals, as well as the Microelectronics Workforce Development Hub, throughout FY24.

Most recently, SEMI Foundation is engaged throughout ASU's microelectronics ecosystem as a partner in the Southwest Advanced Prototyping Hub and as a member of the Industry Council, providing guidance on workforce development initiatives. ASU and SEMI Foundation are also collaborating to share ASU's educational professional development content to SEMI member organizations via SEMI University.

Innovation with Applied Materials

Strengthening the microelectronics industry in Arizona and across the nation, ASU and Applied Materials Inc. forged a partnership in FY24 to establish the Materials-to-Fab (MTF) Center, a cutting-edge research, development and prototyping, and training center located in the university's MacroTechnology Works building at the ASU Research Park.

The MTF Center is a place for collaboration – an environment not only for ASU and Applied Materials, but also other industry and government partners, startups and academic institutions working to fast-track innovation from concept to fab prototype. Equipped with state-of-the-art manufacturing equipment, including industry-relevant 300mm production tools, the MTF Center will enable rapid commercialization of research, accelerate innovation and provide opportunities for hands-on learning that builds the microelectronics workforce.

With investments totaling over $200 million from Applied Materials and an additional $70 million from ASU, the state of Arizona and the Arizona Commerce Authority, the MTF Center represents a strategically innovative approach to strengthening the microelectronics industry in Arizona and across the nation.

Semiconductor Manufacturing with NXP Semiconductors

In FY24, ASU forged a new partnership with NXP Semiconductors focused on packaging, an important final step in the manufacturing process. Fueled by the support of the Arizona Commerce Authority and in partnership with NXP, ASU has received a $17.5 million investment to expand and enhance Arizona's fan-out, wafer-level packaging R&D and workforce training capabilities, and drive the creation of a GaN (gallium nitride) manufacturing and research ecosystem in the state, making the technology available to more companies in the industry.

ASU will utilize the funding to purchase equipment to enhance the capabilities of MacroTechnology Works in Tempe. The university plans to expand advanced packaging and GaN research to additional capabilities that support 6G, the internet of things, machine learning and more.

The expansion will also include student opportunities and workforce development initiatives such as internships and university joint research, along with next-gen GaN research development for 6G in partnership with NXP in Chandler.

Resilient Semiconductor Supply Chains with the International Technology Security and Innovation (ITSI) Fund

In FY24, the U.S. Department of State's Bureau of Economic and Business Affairs awarded a $13.8 million cooperative agreement to ASU under the International Technology Security and Innovation (ITSI) Fund, created by the CHIPS Act of 2022. This new initiative bolsters the assembly, testing and packaging capabilities in ITSI partner countries in the Americas and Indo-Pacific, enhancing a resilient supply chain for U.S. semiconductor manufacturers.

The initiative will help ITSI partners create the investment environment to support the semiconductor industry and will bolster workforce capacity to create a pipeline of new talent. Through high-quality workforce development programs, this initiative builds workforce skills that partners need to keep up with advancing technology, secure meaningful employment and

contribute to economic growth and prosperity. The initiative will also allow U.S. semiconductor manufacturers to leverage improved supply chains and labor connections from around the world.

Next-Generation Defense Microelectronics Prototyping

Led by ASU, the Southwest Advanced Prototyping (SWAP) Hub is one of eight regional innovation hubs established under the Department of Defense's Microelectronics Commons, a national strategic initiative to accelerate the development and production of microelectronics technologies that are critical to U.S. security and defense. Funded by a $39.8 million initial DOD investment, the SWAP Hub is one of the first awards under the CHIPS and Science Act of 2022, which aims to revitalize American semiconductor manufacturing capacity and competitiveness.

As the SWAP Hub lead, ASU leverages its ability to convene and engage with stakeholders across diverse sectors. The SWAP Hub's more than 130 regional and national partners work together to accelerate the lab-to-fab transition between research, development and production. They also collaborate to build the microelectronics workforce of the future through curriculum development, learning opportunities and job pathways.

Looking Ahead

To expand the current portfolio of educational offerings, attract a broader set of learners and align with evolving industry needs, ASU will continue to advance six key areas of focus for the Microelectronics Workforce Development Hub led by the ASU Fulton Schools of Engineering:

- **Upskilling the workforce** through stackable microcredentials. Future activities may include the following:
    - Create a pathway to undergraduate degrees for ASU degree holders already working in industry or interested in launching their microelectronics careers.
    - Evolve virtual-reality-based experiences for digital training in-classroom and for public deployment.
    - Implement a "train the teacher" program through upskilling pathways for faculty in Costa Rica, Mexico, Panama, Vietnam, Philippines and Indonesia through the International Technology Security and Innovation (ITSI) Fund created by the CHIPS Act.
    - Increase microcredential offerings in multiple microelectronics technical themes to support training, upskilling and reskilling initiatives.

- **Training the workforce** through academic pathways for students pursuing microelectronics careers, digital training experiences for semiconductor manufacturing, and faculty training and development in emerging microelectronics technologies. Future activities may include the following:

    - Advance partnerships with national organizations for marketing ASU degrees and programs related to microelectronics.
    - Increase research opportunities by integrating workforce development into leading-edge research projects.
    - Strengthen academic programs by developing new courses and updating existing curriculum to align with industry workforce needs and microelectronics career pathways.

- **Inspiring the workforce** through K-12 engagement to increase interest in microelectronics and build pathways through partnerships with regional, national and global organizations. Future activities may include the following:

    - Advance partnerships with other educational institutions to enhance education opportunities with equipment and ASU Core Facilities such as those at the MacroTechnology Works.
    - Develop a summer enrichment program for public high school and ASU Prep students in the Phoenix metropolitan area.
    - Partner with ASU Prep on K-12 engagement, specifically in developing Universal Learner Courses to create a microelectronics-focused pathway.

2023-2024 Individual At-Risk Goal 3

Design and launch an artificial-augmented intelligence strategy for ASU including our new initiatives, our new strategies, rules, and regulations. This will include a technology assessment. The purpose of this is to outline the pathways for ASU to optimize the use of augmented/artificial intelligence in its teaching, learning and discovery activities including how we will manage the pluses and minuses of these technologies in our various settings. The work product is the strategic plan and strategies for launch.

Goal Accomplished

Presidential report

AI at-risk goal

July 2024

ASU's strategic approach to activate the responsible use of augmented-artificial intelligence (AI) across academic, research and work environments.

Inspired by the vast teaching, learning and discovery opportunities, Arizona State University (ASU) is pioneering the responsible use of augmented-artificial intelligence (AI) within higher education.

Research shows that nearly two-thirds of organizations are already actively exploring the integration of AI. At ASU, we believe AI is a catalyst for educational equity, needed innovation and building the strength of the modern workforce.

To achieve this, six strategic pillars (goals) are used to guide our impact across academic, research and work environments.

ASU's six strategic pillars for advancing AI

1. Position ASU as a global leader for advancing AI innovations
2. Enhance student and learner outcomes
3. Create space for active innovation
4. Advance new pathways for research and discovery
5. Redefine the future of work
6. Design the policy, guidelines and robust digital ecosystem required to be accountable to Principled Innovation®

ASU's six strategic pillars for advancing AI are grounded in ASU's **Principled Innovation®** Framework, which guides the ability to imagine new concepts, catalyze ideas and form new solutions that are guided by principles that create positive change for humanity.

AI guiding tenets

A set of guiding tenets are designed to ensure we provide meaningful impact across our strategic pillars.

AI is a powerful technology and will be an enduring part of the innovation landscape for the foreseeable future.

Harnessing the power of AI brings the responsibility to innovate in a principled way, centering our charter and values of inclusion and access.

AI can support human intelligence and capabilities, rather than replace them, to promote equal access to creativity and amplify potential.

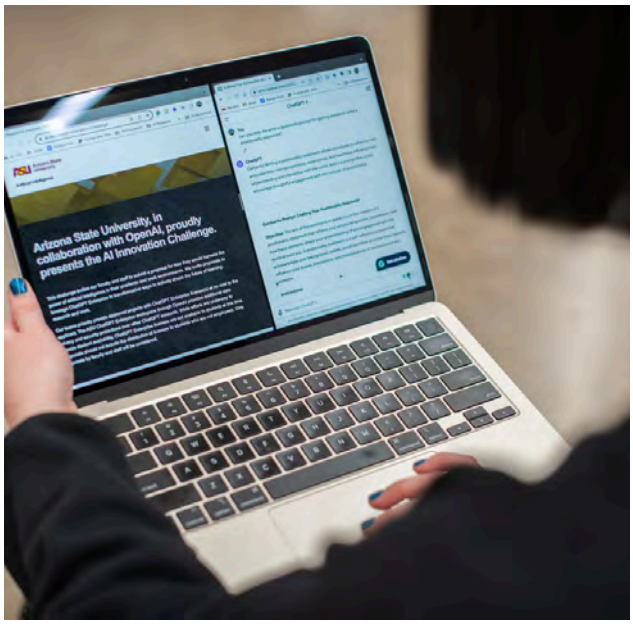
We have a responsibility to our community to keep pace with the rapid progression of AI.

This technology must be easily accessible to people from diverse backgrounds, aiming to bridge the accessibility gaps.

In order to realize impact at scale, a set of regulations, requirements and technologies have been established to guide the responsible use of AI across the public enterprise.

This foundation enables ASU to stand at the forefront of AI, propelling the university to develop unique and transformative applications that push the boundaries of what is possible for today, tomorrow and future generations.

ASU's AI strategy is principled and agile, smartly navigating the universal challenges of high costs and computing limitations with a data-informed, impact-focused approach.



Strategic pillar 1

Position ASU as a global leader for advancing AI innovations

Description:

Recognized as a national leader in AI, ASU takes a Principled Innovation® approach – in which we embrace the possibilities while respecting the concerns of our community.

ASU's commitment to collaborate early with industry leaders, such as OpenAI and Amazon Web Services (AWS), sets us apart. This positions ASU to participate actively in defining new advances in technology for higher education.

Through strategic collaborations and partnerships, ASU plays a dual role in activating the use of technology across academic, research and work environments while providing industry leaders with critical insights and feedback that allow them to meet the unique needs of a university better.

At a glance:

- In October 2023, the launch of ai.asu.edu marked a significant milestone for ASU, establishing a dedicated platform to share information and updates on the university's AI development, research and education offerings. This initiative highlights the innovation, collaboration and practical application of AI technologies across various disciplines. Since its launch, the website has generated over **60,000 unique visitors**.
- In November 2023, longtime partners ASU and Amazon Web Services (AWS) **announced the next phase** of the ASU Cloud Innovation Center, powered by AWS. Together, they will advance the use of AI in the public sector.
- In January 2024, ASU entered into a new collaboration with OpenAI, making it the first higher education institution to collaborate with the AI research and deployment company behind ChatGPT. Since February, the university has activated over **200 projects** and provided **1,036 licenses** for ChatGPT Enterprise across academic, research, and work environments through its **AI Innovation Challenge**.
- In May 2024, OpenAI announced a new offering called ChatGPT Edu, and cites feedback from the early collaboration with ASU as providing critical insights to inform this new product.

ASU takes a **Principled Innovation** approach – in which we embrace the possibilities while respecting the concerns. One aspect that sets us apart is our commitment to collaborate early with industry leaders to position ASU strategically and participate actively in defining new advances in technology for higher education.

The **ASU Cloud Innovation Center**, powered by AWS, has been operating from the Skysong Innovation Center for over five years and was one of the first to be established under the AWS program in 2018. The launch of the reimagined ASU Artificial Intelligence Cloud Innovation Center (AICIC), powered by AWS, expands the effective use of AI for public sector organizations on a global scale—including global government agencies, education institutions, and nonprofits – to address their mission-related challenges and uncover new opportunities.

The AICIC has already helped create and deploy a generative AI-powered chatbot that helps local organizations get real-time support to address cybersecurity risks, a resume analyzer for ASU, and a tool to query medical documents for a local medical center.

In January 2024, ASU entered into a new collaboration with OpenAI, making it **the first higher education institution** to team up with the AI research and deployment company behind ChatGPT. The collaboration between ASU and OpenAI brings the advanced capabilities of generative AI into higher education, setting a new precedent for how universities enhance learning, creativity and student outcomes.

ChatGPT was unveiled to the public in November of 2022, and since that launch, the adoption of generative AI tools has surged. Through a commitment to inclusivity and a drive to remain at the forefront of innovation, ASU's collaboration with OpenAI ensures that students, faculty and staff from all corners of the university have access to the latest developments in AI, are supported in their exploration of such tools to enhance creativity and innovation, and are also provided with safeguards to ensure data privacy and security.

Since February, the university has activated over 200 projects and provided 1,036 licenses for ChatGPT Enterprise across academic, research and work environments through its **AI Innovation Challenge**. The Challenge provides ChatGPT Enterprise licenses to approved projects from university faculty, staff, researchers and — starting in summer 2024 — students.

The Challenge is designed to encourage active participation from the community while providing the support and technical infrastructure to ensure the responsible deployment of new AI tools. Submissions were evaluated in alignment with **ASU's Charter** and the program goals, including innovation and originality, the potential for significant impact, feasibility and clarity of the implementation plan.

In total, the Challenge received **over 400 proposals**. Notably, **14 of the 17** schools, colleges, and multiple enterprise units and initiatives are represented, demonstrating interest and impact across the ASU enterprise.

Spring 2024 completed

- Feb 1 - 12: Call for proposals resulted in over 175 submissions
- February 16 - May 10: 105 projects were activated

Summer 2024

- March 25 - April 15: The call for proposals resulted in 200 submissions, an **uptick of 14%** from the previous semester.
- May 3 - August: 114 projects were activated and are underway

Preparations are in progress for a fall 2024 Challenge.

Placing Principled Innovation at the forefront, the Challenge is designed around three impact areas:

- Enhancing teaching and learning
- Advancing research with societal impact
- Driving the future of work

These impact areas empower individuals to make meaningful contributions to AI research and application while showcasing their talents, ideas and creativity.

To date, **219** projects have been activated across teaching and learning (75), research (72) and the future of work (72). Examples of work from across the ASU public enterprise include:

- Christiane Reves, an assistant teaching professor of German in Arizona State University's (ASU) School of International Letters and Cultures, and colleagues in her department think that "**Language Buddy**" – a GPT they created in ChatGPT Enterprise as part of the university's AI Innovation Challenge – could be the solution to getting students to practice their language skills. Powered by generative artificial intelligence (AI), Language Buddy will allow students to participate in conversations at their language level — anytime, anywhere. **Learn more**.
- In Spring 2024, AI served as a writing companion for a graduate writing course. Assistant Professor Jake Greene's course is designed to teach scholarly writing. Graduate students were tasked to use ChatGPT Enterprise as a **writing companion**, providing peer-like reviews and ensuring all four elements of their writing objectives were addressed. The main area in which students find value in the tool is idea generation for structuring their writing and determining what content to include. **Learn more**.
- A team from The School of Computing and Augmented Intelligence is tackling traffic congestion with a **real-time traffic management system**. This system will analyze real-time data to predict traffic flow and optimize routes for a mix of autonomous and human-driven vehicles.

ASU schools and colleges with projects part of the AI Innovation Challenge		
The College of Liberal Arts and Sciences	College of Health Solutions	Barrett: The Honors College
Ira A. Fulton Schools of Engineering	Herberger Institute for Design and the Arts	College of Integrative Sciences and Arts
W.P. Carey School of Business	New College of Interdisciplinary Arts and Sciences	Thunderbird School of Global Management
College of Global Futures	Walter Cronkite School of Journalism and Mass Communication	
Mary Lou Fulton Teachers College	Watts College of Public Service and Community Solutions	

Additionally, the Challenge has allowed ASU to assist OpenAI in shaping higher education offerings, focusing on data privacy and security. On May 30, 2024, **OpenAI announced** its newest offering: **ChatGPT Edu**. The goal, as outlined in their announcement, is to bring universities and researchers access to the latest artificial intelligence (AI) models. ASU's early adoption and collaboration played a key role in helping to inform the new offering.

ChatGPT Edu will roll out in the summer of 2024 with features that include access to **GPT4o** — the latest model that reasons across audio and vision, in addition to text — as well as robust administrative controls and data security.

ASU provided critical insights to inform the new product offerings, including:

- Enable **access across a variety of roles** – examples include student movement, granular access controls (professors can make a GPT accessible only to their class), and granular edit controls (multiple faculty or instructional designers can edit a single GPT)
- **Data remains secure**—the ASU workspace within OpenAI's environment ensures that ASU keeps data separate and it is not used to train OpenAI's language models.

ASU's adoption of a principled and agile AI approach complements the AI Innovation Challenge. The university deftly navigates the universal challenges of high costs and computing limitations with a data-informed, impact-focused approach, ensuring that AI outcomes — both from the challenge and external — are functional and actionable.

In continuing to chart the pathway of technology and innovation, the **AI Acceleration team** was launched in August 2023. The conception of this intuitive team is part of what sets ASU apart from other institutions navigating the AI space: ASU aims to be a meaningful innovator and adopter of AI, with a hyper-focus on how the technology can impact and augment ASU's business functions. While the university implemented AI tools quickly and thoughtfully, it is leveraging the knowledge and experience of groups like the AI Acceleration team to ensure the impact of all AI integrations will be meaningful and timely. This commitment ensures that ASU leads in technological advancements and sets a benchmark for meaningful progress in the academic and business worlds for the foreseeable future.

Strategic pillar 2

Enhance student and learner outcomes

Description:

As one of the largest universities in the nation, ASU is committed to providing excellence in education through programs and initiatives that enable the success of each unique student and increase access to higher education for all. ASU's approach to AI focuses on leveraging these tools to augment, not replace, human intelligence and creativity.

Much of the work focuses on teaching digital literacy skills related to the responsible use of AI for teaching and learning for faculty, staff and students. In doing so, the ASU community is prepared to be at the forefront of technological advancements so that it can learn, work, and thrive.

Embed AI into ASU's technology-enabled learning experiences

- A new initiative led by the Provost Office developed shared curricular resources to **enhance AI literacy** among students across disciplines. Modularized core content on AI will be regularly updated and reviewed to allow faculty to customize the content for their specific disciplinary needs while achieving AI literacy objectives.
- A **$3.75 million grant from the Institute of Education Sciences** (IES) will support the Learning Engineering Institute at Arizona State University in developing AI-enhanced applications for education.
- In partnership with EdPlus and Enterprise Technology, Dreamscape Learn at ASU is a fully immersive virtual biology lab. An **AI companion** is designed to turn the Alien Zoo or any character within it into one that can respond to student inputs and prompts. This can be combined with Whisper AI, which has speech recognition, to generate **potential conversive moments in VR**. It will help develop a foreign language learning module in the long term.
- Study Hall AI assistant, Hallmate, in partnership with Learning Enterprise and EdPlus, is using Google DeepMind to build an AI agent based on Gemini LLM and optimized, trained, and evaluated to **display specific pedagogy principles** (identifies goals, promotes engagement, explains concepts, monitors motivation, inspires interest).
- Question Generator, a tool from EdPlus, streamlines the creation of quizzes and item banks with the question generator tool. Faculty can start by specifying the number of questions they need, choosing the question types, and providing the content basis.
- ClipGist, a tool from EdPlus, ClipGist transforms lectures and video transcripts into compelling content with ease. Faculty start by providing a link to a Wistia video or uploading a transcript from MediaPlus or YouTube.
- Image Accessibility, a tool from EdPlus, enhances the accessibility of course images with this intuitive tool. Designed to generate alt text and detailed descriptions effortlessly and extract text from slides and images that are not accessible, this tool simplifies the creation of inclusive content.
- AI Foundations is a course presented by Learning Enterprise's CareerCatalyst. Prompt engineering is one of the hottest new jobs working with artificial intelligence. This course is an on-ramp for anyone who wants to level up their ChatGPT skills.
- **AI Career Coach,** in development by Learning Enterprise and Enterprise Technology, allows learners to use a chat interface to ask for help with a specific career or job search challenge. The Coach automatically generates small, actionable job-search-related tasks to help learners build their professional profile.

Develop new courses, certifications, programs and degrees

This year, the Academic Enterprise launched several new programs and initiatives tailored at **advancing education through the use of AI**:

- W.P. Carey offers a Bachelor of Science in Artificial Intelligence in Business, a **Master of Science in Artificial Intelligence in Business** and an **MBA Concentration in AI** and a **Certificate in AI**. In addition, the **two Bachelor of Science programs**, one in artificial intelligence in business and the other in financial technology, will be offered at ASU starting in Fall 2024.
- Fulton School of Engineering **launched** a Master of Science in Robotics and Autonomous Systems.
- Sandra Day O'Connor College of Law **announced the launch** of new AI curriculum across its degree programs, including AI in legal operations and privacy and legal ethics in AI.

Design new AI-powered experiences to guide the academic journey

- **Degree Recommendation Engine**, created by EdPlus and Enterprise Technology, is an AI experience that helps students navigate ASU's 400+ degree programs by aligning educational program offerings with an individual's personal interests and preferences. The tool provides individuals with up to three-degree recommendations with text to describe how the program meets their interests and goals
- **ASU was awarded $3.75M** to create an app that offers **audio recordings of course content**, including lectures, discussions and summaries. The app will use generative AI to include additional features that encourage active learning strategies, including self-explanation and summarization, to help improve students' engagement with content in different ways and contexts.
- EdPlus is piloting **InsyncAI,** an enrollment management assistant. This will ease the discovery and enrollment process for prospective students and address other program-related intricacies in a manner that the previous chatbot could not accommodate. This shift towards leveraging advanced technology aims to supplement the student experience and reduce the load on our call centers and content teams, resulting in a more efficient, helpful support infrastructure.
- A series of GPTs are being developed in collaboration with the Enterprise Technology AI Acceleration team and faculty, including **MathGPT**, created by ASU faculty Danielle McNamara, as well as Possibility **Thinking Bot** and **Legacy Project bot,** created by ASU faculty Ron Beghetto.
- ASU Prep is working to create a math-intelligent tutor named **Archie**. Archie lives in Gigit and will replace Gredarius for Algebra.

Strategic pillar 3

Create space for active innovation

Description:

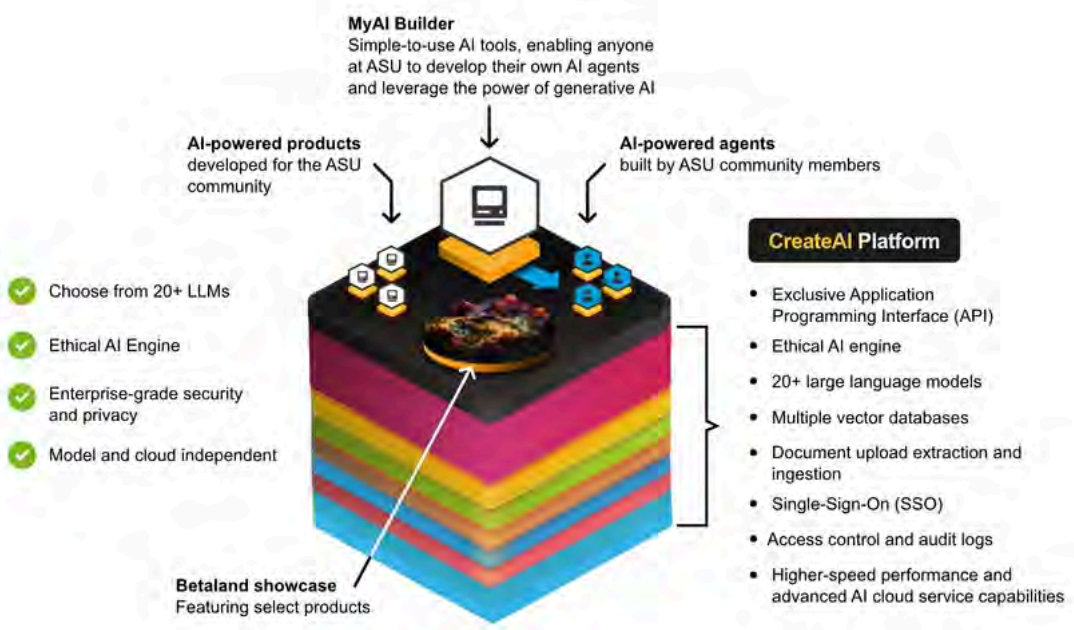
By exploring opportunities to evolve support through the strategic implementation of AI, faculty and staff are getting a deeper understanding of AI with the shared goal of improving the teaching and learning experience.

Provide ongoing education and community support

- Partners from Enterprise Technology, Academic Enterprise, EdPlus and Learning Enterprise created the **Teaching and Learning Generative AI course** for faculty and staff. To date, close to **2,300** ASU community members have enrolled in the course, which is designed to get progressively more complex, moving through modules in knowledge (recommended for folks with no previous experience), skill (using one or more AI tools), and application (regularly use AI tools).
- Nearly **50 AI workshops** have been designed for continuing education, including a class on AI Upskilling, Using ChatGPT as your Teaching Assistant and AI-Powered Assignments: Shaping the Future of Education. These workshops combined saw over **1,400 attendees**.
- Established in 2023, the **AI Communities of Practice** convene monthly to host sessions for faculty, staff, and students. Each session strives to increase AI literacy, collaboration, and networking. Teams across the university can share upcoming releases, products, platforms, and everything AI.

Develop a series of AI-powered products, tools and services to support faculty and staff

- **CreateAI Platform:** The future of AI in education is here. With generative AI, the only constant is change, and the CreateAI Platform is built for that. With our modularized approach to development, we can switch out and add components from vector databases to guardrail approaches to generative AI models as new technology becomes available. The platform is within the ASU garden wall, and no data is given to third parties, providing a private and secure environment to build upon.
- **CreateAI Toolkit** was created to empower non-engineers to build AI experiences with the tools the AI Acceleration team created to bring together a suite of tools and services, including MyAI Builder, Model Comparison, ASUGPT and the Ethical AI Engine.
- **MyAI Builder** is a tool designed to help make building custom AI experiences easy for everyone. Users can develop a custom AI experience in as few as three steps. With over 20 large language models available, MyAI Builder offers a range of models from top industry leaders, including OpenAI, Amazon Web Services, Google and Meta.
- **ASU's Model Comparison** is designed to help users select the right large language model to power their AI experience. Users can test up to six large language models at once to evaluate the models based on the time required to generate a response, the associated costs, and the content of the response delivered across various models.
- **ASU GPT** is a chatbot trained on the vast knowledge of Arizona State University to offer information, guidance, and insights to enhance your learning experience.
- **Syllabot** is an AI-powered chatbot that helps students navigate the syllabus for a specific course. In addition to working with their faculty, students can input questions into Syllabot to help navigate the courses' schedule, assignment breakdown and more as outlined in the syllabus.
- Learning Enterprise is developing an **AI Grading Helper**. This tool provides important capabilities to graders of written assignments, including a unified dashboard of assignments that need to be graded and grading feedback, as well as rubric evaluation and specific quotes to support graders in giving feedback to students.



Strategic pillar 4

Advance new pathways for research and discovery

Description:

ASU's Knowledge Enterprise – which leads the university's groundbreaking research activity – has 19 centers, initiatives and laboratories dedicated to exploring and activating AI models. This provides a foundational setting for the university to continue to expand research activity into generative AI models.

Research centers drive discovery forward

- The **Southwest Advanced Prototyping Hub** (SWAPHub) at ASU encourages innovative approaches to integrating AI assistance into scientific workflows. This hub is part of the broader Microelectronics Commons initiative. Interdisciplinary teams, including researchers from ASU and its partners, are focused on leveraging AI and machine learning to enhance the prototyping processes in microelectronics.
- The **Global Security Initiative** (GSI) is a cross-disciplinary research enterprise that addresses complex and emerging security challenges, such as cyberattacks, disinformation, human-AI collaborations, and terrorism. The Center for Human, AI, and Robot Teaming (CHART) explores the design and evaluation of effective and ethical human-AI-robot teams in various domains, such as health care, education, and defense.
- The **Center for the Study of Religion and Conflict** (CSRC), an interdisciplinary research center that examines the role of religion in conflict and peacebuilding, is actively engaged in advancing responsible, transparent, and trustworthy AI use through initiatives such as the conversation on religion, ethics and sciences (CORES). CORES seeks to model a dialogical approach of intellectual humility and relational integrity to help correct current societal dysfunction.
- The **ASU Center for Law, Science and Innovation** (LSI) is actively fostering AI's responsible, transparent, and trustworthy use. The Center focuses on developing soft law frameworks as flexible governance mechanisms for AI, addressing the rapid advancements in AI technology and their societal impacts.
- Resources for researchers employing generative AI have been available on the **Sol supercomputer**. These include a large set of downloaded open-source models on high-performance storage, frameworks installed in Python environments and template notebooks for popular applications. For more information, visit **the Research Computing website**.

Develop AI-powered experiences to advance research

- The **ASU Health Research Plan Bot** redefines how we make data-informed decisions by enabling decision-makers to explore and understand the ASU Health Research Strategic Analysis. This extensive research plan and strategy document is completed by asking questions and receiving easy-to-understand responses. The bot processes and analyzes vast amounts of information and provides conversational responses so users can efficiently and quickly understand the information in the document.

Strategic pillar 5
Redefine the future of work

Description:
ASU is enhancing faculty and staff well-being and productivity by ensuring high-quality outcomes through creative approaches, detailing contributions to a positive work environment, employee and customer satisfaction, engagement and company culture.

Develop AI-powered experiences to augment business operations

- Learning Enterprise is developing an **AI Support Ticket Resolution tool** that has been trained on the past two years of support tickets and our knowledge base. The AI tool evaluates all new tickets and determines whether they need to be escalated or responded to immediately. Additionally, the tool proposes a support ticket response.
- **AI HRbot** is being developed by Enterprise Technology and Business and Finance to create a proof-of-concept that streamlines the various information employees need into a conversational AI assistant that can find information quickly.
- **Experience Center Concierge AI Agent** has been developed in collaboration with EdPlus and the Experience Center to create a Call Center Copilot that will connect Success Coaches (EdPlus) and Experience Center Specialists (Enterprise Technology) to internal knowledge base content via an AI chat experience.
- **ASU Foundation Engagement and Referral** was designed by Learning Enterprise and Enterprise Technology to track when a donor gives to the ASU Foundation. This AI tool intelligently recommends available research studies and online courses they might be interested in based on the funds they have given to.
- AI Content Creator, Library and Recommendation Engines are in development with Learning Enterprise and Enterprise Technology. Content will be customized to the individual, requiring a new content production, management, and recommendation approach. This project will develop **The Content Creator** and rapidly accelerate the process of converting existing ASU learning content into bite-sized, stackable modules or highly personalized new courses. **The Library** is a set of extremely high-quality learning assets built on top of modern vector databases so learners can automatically find the perfect piece of content based on each learner's needs and interests. **The Recommendation Engine** is an AI tool that recommends the ideal pathway of learning experiences for an individual, given their goals and current skills.
- The **AI Transcription tool** is being tested with Learning Enterprise and Enterprise Technology. It automatically creates a transcript webpage for any video or audio file. The webpage is built to meet standard web accessibility standards, making it user-friendly and screen reader-friendly.

Strategic pillar 6

Design the policy, guidelines and robust digital ecosystem required to be accountable to Principled Innovation®

Description:

ASU prioritizes equity, privacy and human-centered design, ensuring that the university's AI solutions deliver social benefits while respecting individual rights and dignity. Through continuous research and evaluation, we strive to create technology that reduces inequities and expands access, always seeking to positively impact society.

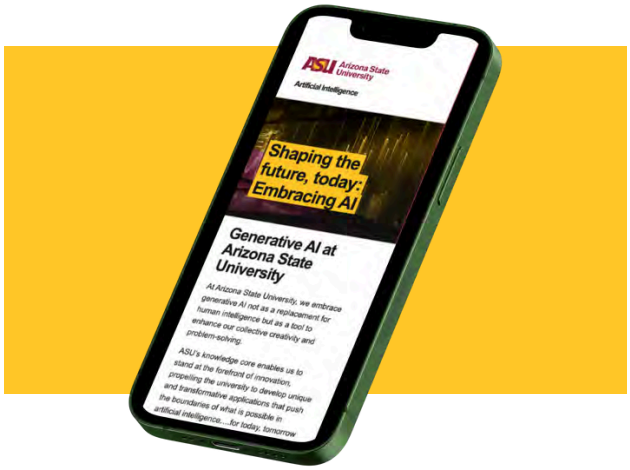
- To achieve the goal of integrating AI into ASU courses and operations, several administrative, personnel, resource allocation, and policy changes have been implemented, including 1) resources from the Office of the University Provost, with guidance for course syllabi for the inclusion of AI into courses; 2) the creation of Digital Trust Guidelines for the use of generative AI; 3) the creation of the AI Acceleration team to align our talent towards this goal; and 4) training offerings from Human Resources specifically designed to equip faculty and staff with the skills and knowledge needed to work with AI.
- Over the last year, significant effort has been dedicated to evaluating and testing cutting-edge technologies, methodologies, and AI products to ensure only the best reach our community. ASU teams have vetted over **50 new AI vendors**, collaborated with over **20 existing vendors** and partners to shape their AI products, and prototyped over **100 generative AI technologies and methodologies**.
- ASU stays at the forefront of technological advancements by utilizing top-tier tools, evaluating new products, and prototyping solutions. ASU's commitment includes ongoing evaluation, rigorous vetting processes, adopting and implementing new technologies, and maintaining strong partnerships with leading providers like AWS and OpenAI. Through continual testing and prototyping, we ensure that we adopt solutions that truly enhance our operations and academic environment.

- **Ethical AI Engine** has been created by the expert data scientists in the AI Acceleration team, who developed multifaceted evaluations to screen AI output for bias, accuracy and ethical integrity, including fairness and resistance to disinformation. This innovative framework is comprehensive and extends evaluation to key aspects of AI usability—including response accuracy, processing speed, and propensity for hallucinations—alongside critical ethical considerations such as handling sensitive queries.
- The **Faculty Ethics Committee on AI Technology** supports Enterprise Technology in advising on ethical practices and responsible design of AI technology in an environment of constant change. The committee's primary responsibility is to review, advise and shape guidelines/guardrails related to AI use in technology products. The committee's expertise in ethics and AI's potential implications enables them to analyze the ethical challenges associated with AI technologies, including data privacy, bias, transparency, and social impact.
- **Guidelines for the use of AI in research** prepared by Knowledge Enterprise highlight the importance of starting any research project that involves AI, and is strongly recommended that users discuss the appropriateness of using the technology with their co-investigators, collaborators, and field experts.
- The Academic Enterprise has prepared approaches to **syllabus statements concerning the use of AI understanding** to seek the balance of the promise of generative Artificial Intelligence (AI) tools to improve learning outcomes with the need for academic integrity, rigor and transparency.
- The ASU Library has created **citation guidelines for AI**.

Our commitment to the future

This report and body of work represent the ASU strategic vision and collective commitment to shaping the future of education by embracing AI.

For more information, visit **ai.asu.edu**.



FY2024 Additional Assignment

Fully implement the General Education Program, in compliance with Board Policy, as a required single pathway for all first-time incoming students in Fall 2024.

Goal Accomplished

Arizona State University

General Studies Gold Implementation

Executive Summary

Arizona State University has successfully implemented a new general studies curriculum, General Studies Gold, which meets all requirements of ABOR policy 2-210. Incoming ASU undergraduate students with a catalog year of 2024-2025 or later will be required to meet the General Studies Gold requirements. As of spring 2024, General Studies Gold designations appear on courses in the catalog and on the fall 2024 schedule of classes.

ASU has also implemented procedures that ensure the continued integrity of this curriculum. Courses approved for General Studies Gold designations will undergo regular mandatory reviews and random audits to ensure compliance with the category learning outcomes.

Strategic Significance for Arizona State University

The General Studies Gold program draws inspiration from ASU's charter and design aspirations to create a program uniquely representative of ASU. The goals of the General Studies Gold program include:

- Engaging students in modern scholarship addressing a variety of issues relevant to citizens
- Providing a flexible curriculum within which students make choices based on what is most interesting and relevant to them
- Developing students' abilities to analyze problems and create solutions using multiple perspectives and methodologies
- Supporting inclusive student success

The requirements of General Studies Gold are clear and straightforward. Students must complete first-year composition in addition to courses in the nine General Studies Gold categories as seen in Figure 1 below.

Figure 1. General Studies Gold Categories

Implementation

Implementation of the General Studies Gold program required the expeditious work of faculty and staff from nearly every area of the university. Teams reviewed the curriculum, modified enterprise technologies, communicated changes to faculty, staff, and students, designed and held training sessions, developed websites, and completed countless behind-the-scenes tasks essential to a successful transition.

Curricular Implementation

The ASU General Studies Council reviewed and approved courses proposed to fulfill a General Studies Gold requirement. In fall 2024, over 800 ASU courses approved for General Studies Gold designations will be offered. The General Studies Council also approved articulation rules aligning all Arizona community college courses and 1,750 out-of-state and international department electives with General Studies Gold designations. As of June 14th, 2024, the total number of transfer courses updated to General Studies Gold is 240,685.

In March 2024, all ASU 2024-25 baccalaureate program curricula (i.e. “major maps’), representing 630 undergraduate programs, were updated with the General Studies Gold

requirements and published on the ASU website and in the catalog. All new students entering ASU in fall 2024 will follow the 2024-25 major map for their baccalaureate program and must fulfill the General Studies Gold requirements for graduation. Honoring existing agreements, continuing ASU students and incoming transfer students in catalog years of 2023-24 or earlier due to continual enrollment in an Arizona community college are not required to make any changes to meet their general studies requirements.

Enterprise Technology

A student-centered approach leveraged User Experience (UX) enhancements to create a seamless transition to General Studies Gold for incoming students while mitigating any negative impact on any student completing their degrees in General Studies Maroon. These systems included the ASU Degree Search (major maps), Course Catalog, Class Search, degree audits (u.Achieve), Transfer Guide, and the student portal, My ASU.

Communications

Following faculty senate approval of the General Studies Gold curriculum, ASU communicated with all relevant audiences. An email from the provost and CFO to all ASU employees launched a series of communications including additional training, presentations, and toolkits for key academic support groups (e.g., academic leadership, academic advising, student success support staff, curricular development staff, new student orientation teams, admissions recruiters, transfer evaluators) so that these individuals were prepared to support student questions. An ASU website was created and continues to be maintained and updated to describe General Studies Gold at ASU. Information for students regarding general studies was strategically integrated into regular communications on fall course registration and sent to students during the spring 2024 semester.

2021-2024 Multiple-Year At-Risk Goal 1

Demonstrate increased enrollment and student success in adaptive learning courses through offering more than 15 courses, with an increase in overall course completion (grade C or better) to more than 80% (from a base of less than 50%).

Goal Accomplished

Goal: Demonstrate increased enrollment and student success in adaptive learning courses through offering more than 15 courses, with an increase in overall course completion (grade C or better) to more than 80% (from a base of less than 50%).

Goal Achieved

- Adaptive efforts are focused on lower division intro math, intro economics, psychology, biology, and astronomy
- Enrollment in the courses reached 31,445 students in 2022-23, and are estimated to exceed 29,378 for 2023-24, an increase of +22% since 2021.
- Preliminary outcomes for Fall 23 – Spring 24 show overall success rate (C or better) of 85% and mastery (B or better) of 65%.
- Course grades improved, especially in AST 111 and ENC 211. The ECN 211 grades had a larger impact because the number of sections/students also increased.

Enrollment Actuals

Enrollment	2021	2022	2023	2024*
Actuals	23,995 (base)	26,568	31,445	29,378 (+22%)

*Preliminary

Strategic Importance and Future Work

ASU's charter demands we work tirelessly to ensure the success of all students. Accordingly, we are committed to ongoing curricular and technological innovations as the engines for addressing improved course outcomes.

2021-2024 Multiple-Year At-Risk Goal 2

For Arizona students, increase enrollment and number of graduates by more than 10%.

Goal Not Accomplished

Note: In these slides, progress toward this goal is measured by the number of Arizona resident undergraduates enrolled and earning bachelor's degrees.

ASU’s commitment to Arizona residents

ASU aims to increase **enrollment and graduation rates among Arizona residents by more than 10%.**

Arizona resident enrollment: Progress toward goal

12-month enrollment trends show that enrollment of Arizona residents at ASU increased significantly between fall 2017 and fall 2020, but have stagnated in post pandemic years.

Pre-Pandemic Enrollment Growth

From 2017 to 2020, Arizona enrollment increased by **+12.3%.**

In the past decade (fall 2013 to fall 2023) enrollments grew across campus and digital immersion by 11,619 students to:

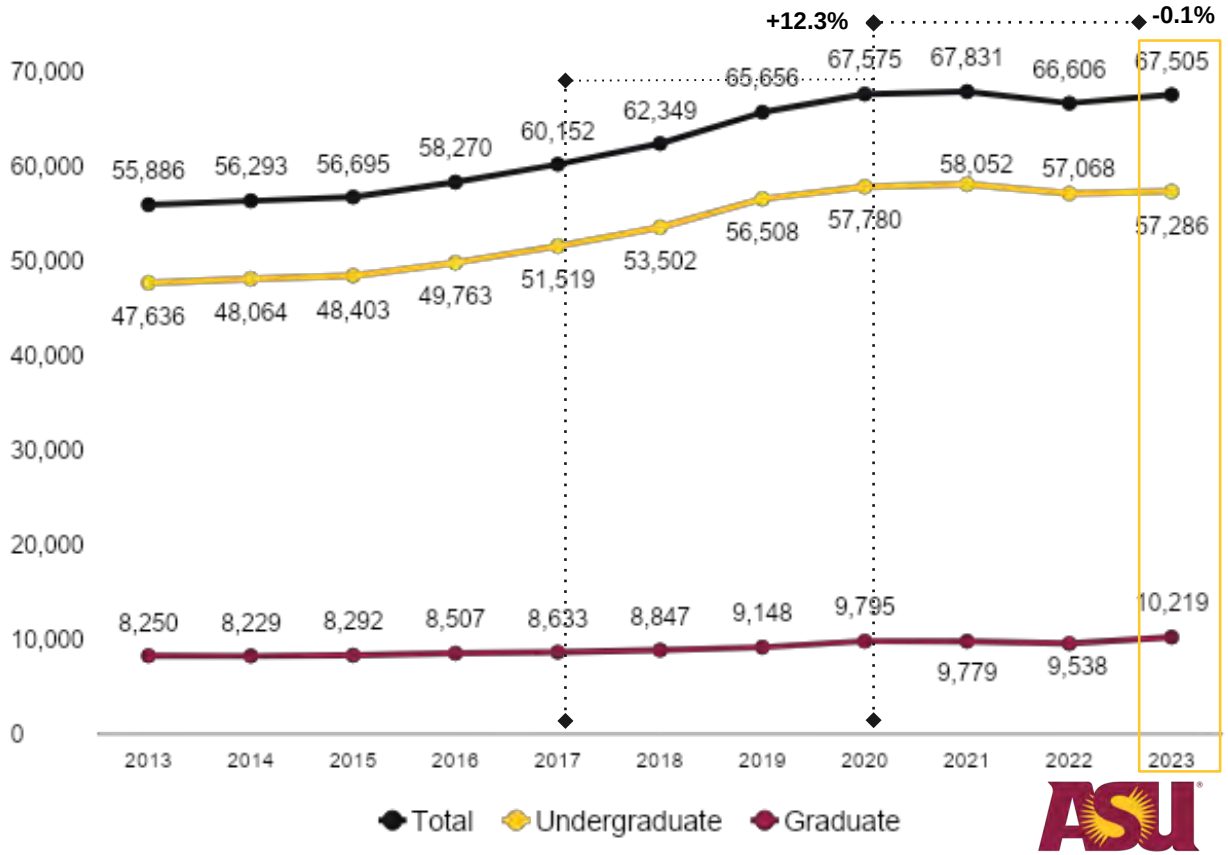
67,505 (21% increase)

Undergraduate enrollments have grown since 2013 by 9,650 students to **57,286** (+20%.)

Graduate enrollments have grown since 2013 by 1,969 students to **10,219** (+24%.)

2013-2023 Resident 12-Month Enrollment

Undergraduate and Graduate



Arizona resident graduates: Progress toward goal

While graduation trends have slowed in post-pandemic years, ASU continues to graduate Arizonans at historic levels.

13,850
2023-24 Resident Bachelor's Degrees
Goal not met

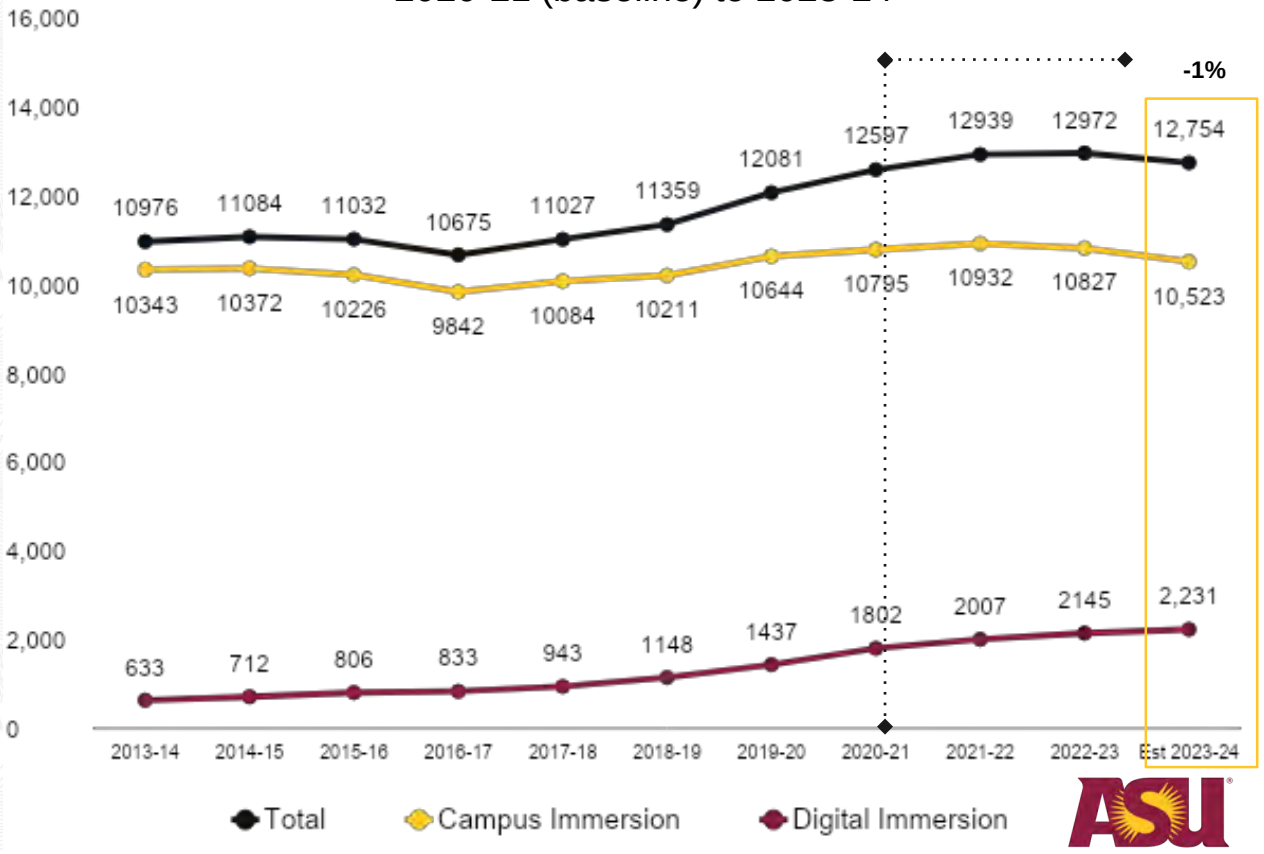
12,754
2023-24 Resident Bachelor's Degrees
Estimated

12,972
2022-23 Resident Bachelor's Degrees
Actual

12,597
2020-21 Resident Bachelor's Degrees
Baseline

2021-2024 Individual Multiple-Year Goal

10% growth in resident bachelor's degrees
2020-21 (baseline) to 2023-24



Demand for an ASU degree among Arizona residents remains strong, however, new strategies are needed to accelerate enrollment to meet ABOR goals.

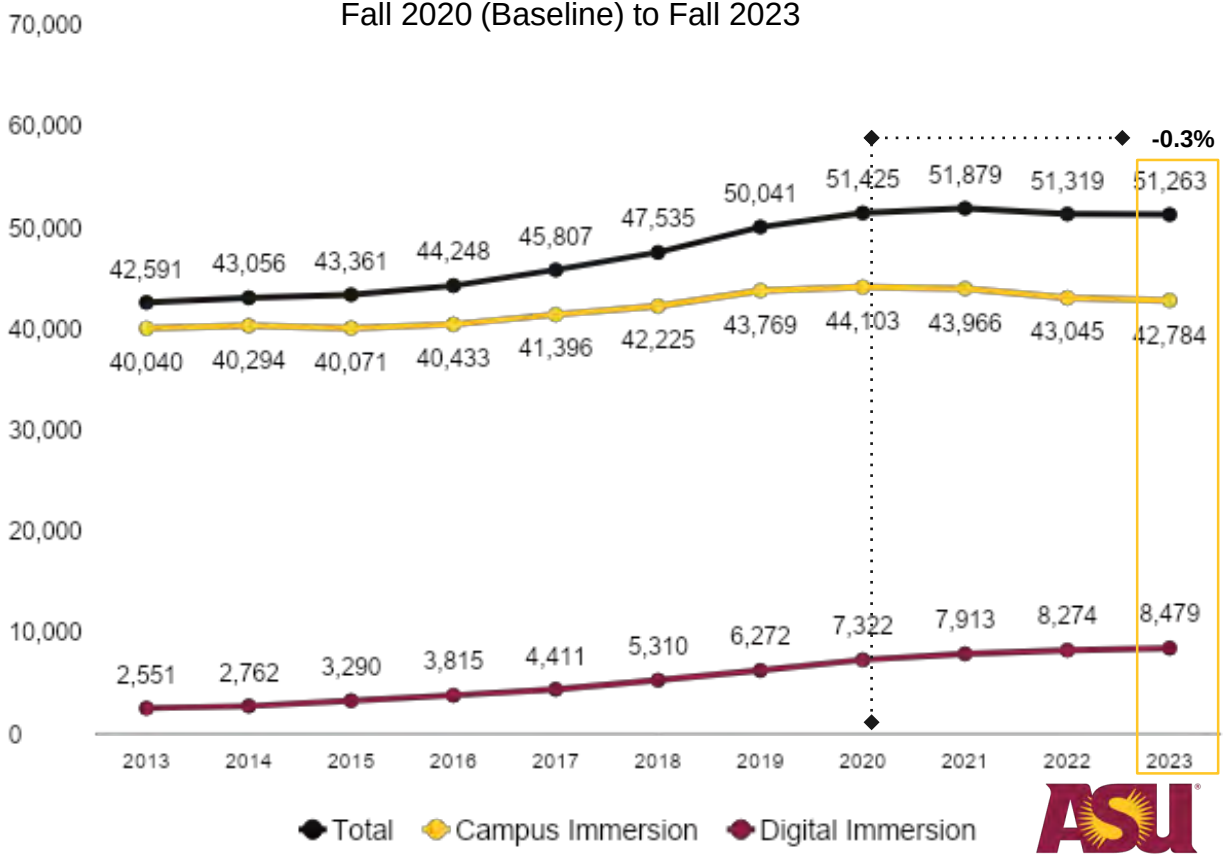
ABOR Goal: 56,503
Fall 2023 Resident Undergraduate Enrollment
Goal not met

51,263
Fall 2023 Resident Undergraduate Enrollment
Actual

51,425
Fall 2020 Resident Undergraduate Enrollment
Baseline

2020-2023 Individual Multiple-Year Goal

10% growth in Resident Undergraduate Fall Enrollment (IPEDS)
Fall 2020 (Baseline) to Fall 2023



Looking ahead: ASU's engagement strategies with AZ residents will focus return on investment.

A bachelor's degree remains a strong investment for individuals.

In terms of increased wages relative to tuition, fees, and forgone earnings, the current net present value of a college degree is $480,000 for men and $342,000 for women. This equates to a **return on investment of 14.2% per year for men and 13.9% per year for women.**

A bachelor's degree remains a strong investment for the state of Arizona.

Economists estimate that bringing Arizona's share of workers with a bachelor's degree to the national average would result in **direct effect of $14.3 billion**, **a spillover effect of $17.9 billion, and an increase in state government general fund revenue of $1.7 billion** over the course of the next 32 years.

ASU must continue to create capacity for an increasing the number of students as implicit in the ASU Charter; emphasizing access, inclusion, discovery, and fundamental responsibility for the communities it serves.

Source: Seidman Research Institute, "The Economic Impact of Raising the Educational Attainment of Arizona's Workforce: 2019 Update"

Looking ahead:

Strategies underway that will accelerate enrollment and degree attainment among Arizona residents.

Prospective High School Students

Statewide campaigns that focus on affordability and value of an ASU degree including: FAFSA Campaigns | College Ready AZ campaigns to promote AZ Promise Program in partnership with ABOR | LE Earned Admissions Pathways | Promotion of institutional scholarship programs include Obama, RaiseMe, WeGrad, ASU Helios partnership | expansion of Tri-University programming for FAFSA and college readiness

Prospective Transfer Students

Statewide campaigns that promote efficient pathways toward in demand job opportunities: Prospective transfer students will receive all of the above communication strategies plus specific MyPath2ASU communications for those enrolled in community colleges across Arizona.

Prospective Graduate Students

Statewide campaigns that promote modality flexibility and career advancement: Promotion of digital immersion offerings | Redesign of programs that align with industry needs (health, engineering, global futures, among others).

Persist Existing Students to Graduation

Enterprise efforts to increase student success: persistence goals for all undergraduate students | curricular and technological innovation | coordinated care facilitated by advanced analytics | reentry campaigns and services

2021-2024 Multiple-Year At-Risk Goal 3

Complete the design of the Global Futures Laboratory, with anticipated engagement of more than 700 faculty. Successfully merge the three schools of the College of Global Futures into a unique college with thousands of students (majors and minors).

Goal Accomplished

COMPLETE THE DESIGN OF GFL, WITH ANTICIPATED ENGAGEMENT OF MORE THAN 700 FACULTY

The threats to our planet and its inhabitants — extreme weather, drought, food insecurity, sustainable energy and more — are increasingly complex and accelerating. Arizona State University, a longstanding leader in global sustainability and the most innovative university in the U.S., is ideally positioned to address these challenges.

Ranked No. 1 in the U.S. for global impact in advancing the United Nations Sustainable Development Goals, ASU unites top scholars and innovators in the **Julie Ann Wrigley Global Futures Laboratory®**. This first-of-its-kind hub for global collaboration brings together leading minds dedicated to creating a future in which all life on earth can thrive.

Designing a thriving future requires a holistic approach defined by transdisciplinary research and open collaboration among universities, businesses, policymakers and the general public. GFL's mission consists of diagnosing social and environmental pressure points, developing new ways of acquiring data from all components of the Earth system, and developing options for trajectories into a future that is positive for people and the planet.

The laboratory consolidates existing research efforts and schools and augments them with new ones. For example, the Global Institute of Sustainability and the Institute for the Future of Innovation in Society have merged to become an encompassing research institution: the Global Institute of Sustainability and Innovation.

The Global Futures Laboratory draws on ASU's deep commitment to use-inspired research, the ongoing work in sustainability and service to the global community in which we live, explored across five core spaces:

Discovery Learning Solutions Networks Engagement

The hub of the physical home of the Global Futures Laboratory is the Rob and Melani Walton Center for Planetary Health (WCPH) on the Tempe campus, a **LEED Platinum** flagship research facility designed purposefully centered around empowering collaboration, which makes it a vital tool in ASU's endeavor to shape thriving global futures for all of Earth's inhabitants.

The WCPH building is where research and collaboration coexist with education and outreach; where Sonoran ecology meets mediated technology; and where social engagement meets academic discourse. The building supports students, faculty, and

staff, researchers and innovators from ASU and the adjacent NOVUS Innovation District, as well as the local Tempe community events.

The building incorporates several sustainability features, including a mechanical tree to capture carbon emissions, a large atrium biome filled with plants and water from the canal that purifies waste air and recycles water using natural, bio-based methods. The building was built with glass-fiber reinforced concrete panels that absorb and store less heat. The building is LEED V4 Platinum certified, and its design and features help ASU achieve its triple net zero – energy, water and waste – performance goal through regenerative and bioclimatic technologies.

Examples of Global Futures Laboratory Scientists and Scholars led activities are included in the supporting documents **(#1).**

DESCRIBE STRATEGIC IMPORTANCE OF THE GOAL TO THE UNIVERSITY/ENTERPRISE STRATEGIC PLAN

"We need to focus on the future of the planet, not only fixing problems we have created but also using knowledge and innovation to secure its habitability. This is urgent, and this is how what we have built at ASU can have the biggest impact on the world." Michael M. Crow President, Arizona State University

Over centuries, humankind has asked our planet to give more than it has to offer and driven it towards its environmental and societal boundaries. To address this crisis under extreme time pressure, we have to face the daunting task of mobilizing intellectual and material resources of proportions never seen before, and we have to do it now." Peter Schlosser, Vice President and Vice Provost, Global Futures Laboratory, Arizona State University

As evidenced by these quotes, drawing on 840+ scientists and scholars, in addition to creating future generations of leaders, optimally positions ASU to apply our knowledge and innovation in addressing increasing pressure on planetary systems.

Representing every ASU college, campus and beyond, the Global Futures Scientists and Scholars (GFSS) network advances GFL's mission of designing implementable options to sustain global habitability and improve well-being for all humankind. This program supports network members across the spaces and, by extension, enhances the visibility, thought leadership and impact for GFL and all of ASU, across fourteen focal areas.

Intellectual Expertise:

We broaden and diversify collaborations, tracks and networks for Global Futures Scientists and Scholars through targeted inquiries, i.e. the recent NSF Global Centers survey or last year's IPCC survey. We are better able to understand whether and how network members and their work tie into strategic funding opportunities and events of national or global public significance.

Targeted engagement with individual network members builds a deeper understanding of a faculty member's expertise, facilitating future collaborations, award nominations and similar opportunities.

Proof of concept: The network is a subset of all ASU faculty, and as data is gathered and measured, the processes implemented at this scale may be valuable at the enterprise level.

Documenting successes in a public-facing way provides evidence that ASU is already a player on the world stage with respect to topics of national or global significance.

Sharing of findings with ASU News and Media Relations, with the Collaboratory, with colleagues in academic units, and on public-facing profiles provides a service that will advance individual visibility and broaden the influence of GFL across ASU units.

A ready repository of experts allows responses in a timely way to media opportunities, funding opportunities, award nomination opportunities, and important RFIs.

Strengthening ASU Research: Supporting the scholarship of all GFL faculty and students through education and training, with a focus on generating use-inspired research leading to real-world impact and affirmative outcomes.

Global Futures Office of Research Development and Strategy supports all aspects of the GFL Discovery Space, working to enhance funding success by facilitating partnerships and collaborations, as well as creating training and infrastructure to build capacity.

Global Futures Assistant Directors for Research expand capacity for faculty-to-faculty contact. Five ADRs aligned around strategic areas of research development serve network members.

Global Futures College Ambassadors, appointed in each college-level unit at ASU, help learn about new accomplishments and research endeavors within respective colleges, while sharing and reinforcing opportunities that may benefit colleagues – both current and prospective network members.

Global Futures Office of Research Services (GFORS) connects GFL-affiliated scholars to research development, research advancement and other services within GFL and Knowledge Enterprise.

DESCRIBE PROGRESS TOWARD ACHIEVEMENT OF GOAL

Through mid-May 2024, over 840 Global Futures scientists and scholars, contributing to $426M in proposals and $180M in awards, with representation across academic units. Through these collaborations, questions are being asked that no one else is asking, and the right teams are being assembled to answer these questions to achieve the positive impact needed at scale.

PROVIDE DATA OR OTHER EVIDENCE DEMONSTRATING ACHIEVEMENT

GFL accomplishments are highlighted by the following exemplars:

- In January 2024, The U.S. National Science Foundation announced that Arizona State University will lead the **Southwest Sustainability Innovation Engine** (SWSIE), spanning 54 partnerships across Arizona, Nevada and Utah — and is one the first NSF Innovation Engines to accelerate the development of jobs, technologies, policies and solutions by way of green economy and innovation. The NSF will fund SWSIE's initial development and growth with **$15 million over the next two years.** The engine can be renewed for up to **10 years with $160 million in funding available** for each regional engine.

- In May 2024, the Global Futures Laboratory **launched the Water Institute** under the direction of Upmanu Lall. Drawing from existing academic capacity across ASU, the Water Institute is a new center for scholarship and action designed to address global water challenges from community to national scales. Among its many projects, the Water Institute is building a Global Water Collaboratory, a U.S. focused consortium, as well as a coalition across the Western states for learning and collective action that will be a living laboratory for higher education and workforce development in a systems context.

- The **Arizona Water Innovation Initiative** is a statewide project led by ASU's Julie Ann Wrigley Global Futures Laboratory in collaboration with Ira A. Fulton Schools of Engineering. Through this initiative, ASU works with industrial, municipal, agricultural, tribal and international partners to rapidly accelerate and deploy new approaches and technology for water conservation, augmentation, desalination, efficiency, infrastructure and reuse. The state of Arizona invested $40 million in ASU to lead this multi-year initiative that helps ensure a regional thriving future with a secure future water supply. The Arizona Water Innovation Initiative expands the work ASU is already doing in hydrology, engineering, policy and management throughout Arizona and across the Southwest and scales those advancements to implement evidence-based solutions. (first year accomplishments)
- The ASU **Direct Air Capture** research is upscaling with Carbon Collect. Towards the end of 2026, the technology is expected to demonstrate the removal of 1M tons of CO2 per year.

- In June 2023, when ASU and a group of core partners established the ʻĀkoʻakoʻa reef restoration program, decades of research, community partnerships were brought together for a commitment to healthy coral reefs in West Hawaii. In April 2024, scientists and community members affiliated with ʻĀkoʻakoʻa celebrated the official launch of a new, state-of-the-art coral research and propagation facility in Kailua-Kona. This new facility serves as a kind of medical facility for corals, housing broken corals that require care to recover, grow and reproduce. Varying technical methods of coral reef restoration take place in the coral nursery, led by team members from ASU, partners from the State of Hawaii's Division of Aquatic Resources and other partners on the island. The facility consists of 72 coral raceways, or tanks, and is the first land-based coral nursery facility on the island. This facility will support the restoration of 120 miles of coral reefs off the west coast of the Big Island, which have been in decline for the past 50 years.

- Arizona State University, together with partners, was awarded an $18 million NextGen grant by the United States Department of Agriculture (USDA) to create a pipeline of diverse young leaders trained and ready for jobs in the food and agriculture sector, especially at the USDA. Nearly $5 million will be directed to ASU's School of Sustainability students via scholarship support and paid internships over five years to study sustainable food systems.

The Global Futures Office of Research Services (GFORS) serves the institute, the college, the focal areas, and the GFSS network.

GFSS growth: Network growth from **210** in 2010 to **845** in 2024

GFSS faculty across academic units: 28.4% of GFSS come from The College of Liberal Arts and Sciences, 17.3% come from College of Global Futures, and 16.0% come from Fulton Schools of Engineering.

Proposals: $431M proposals in 2019 to $426M in FY24 to date (mid-May). End of year estimate is $500M.

Awards: $142M in 2019 to $180M in 2024 (through mid-May).

Rankings: ASU's continued high placement in the Times Higher Education impact rankings (based on the UN Sustainable Development Goals) demonstrates the capability and capacity of GFL to help propel ASU to national and global recognition.

- As the result of the SDG & Beyond task force, co-chaired by GFL and Thunderbird, ASU is ranked #1 in the US for Impact and top ten globally.

- ASU is one of only 12 institutions worldwide to earn a platinum rating from **STARS**. With ASU's longstanding commitment to ensuring a thriving future for all, ASU has earned a rating of No. 1 in the United States and No. 2 in the world for its sustainability practices by the Sustainability Tracking, Assessment & Rating System, or **STARS**, a program from the Association for the Advancement of Sustainability in Higher Education. ASU not only scored above other highly esteemed institutions, but also beat its previous score — increasing from 2020 by four points, totaling 91.10 points out of 100.

SUCCESSFULLY MERGE THREE SCHOOLS INTO A UNIQUE COLLEGE WITH THOUSANDS OF STUDENTS (MAJORS AND MINORS)

At the College of Global Futures, students collaborate with some of the world's foremost experts at the nation's most innovative university. Here, they acquire the knowledge and skills needed to thrive and make positive impacts on a future they will help to define. United by a shared purpose, the individual schools within the College are dedicated to generating new knowledge, engaging diverse communities, and educating future leaders. Our transdisciplinary framework fosters unique, integrated learning and training opportunities, aligning with our ambitious goal to engage 5,000 students by 2025.

As people across the globe make choices that will shape our world for decades, centuries, and possibly millennia, these students will encounter incredible new

opportunities in emerging or revitalized industries. **Several trillion-dollar industries are waiting to be built,** including new energy systems, the hydrogen economy, new food systems, new transportation systems, and climate solutions, among others.

The School for the Future of Innovation in Society (SFIS) is a transdisciplinary unit at the vanguard of ASU's commitment to linking innovation to public value. SFIS pursues a vision of responsible innovation that anticipates challenges and opportunities, integrates diverse knowledge and perspectives, and engages broad audiences. By examining the ways imagination is translated into innovation — and how technical and social concerns are blended, along the way — a future is built for everyone.

The School of Sustainability (SOS): Established in 2006 as the nation's first, the School of Sustainability's mission is to foster innovative research, impactful education and engaged communities to achieve environmental integrity, social equity and well-being.

The School of Complex Adaptive Systems (SCAS): The planet is the ultimate complex system with many intertwined subsystems that envelop natural, social and technological systems and transcend traditional disciplinary boundaries. This visionary school engages wide-ranging national and international collaborations to advance the exploration of these systems and disseminate fundamental transdisciplinary knowledge through a unique set of academic graduate offerings.

Launched 2022 with first degree offerings in August 2024:
The School of Ocean Futures (SOF): The newly formed School of Ocean Futures expands ASU's capacity to study the Earth system holistically, recognizing that the ocean covers about 70 percent of the planet's surface. This school focuses on the ocean's critical role in the Earth system, especially as human activities increasingly impact of the planet's life-supporting systems. It explores the fundamental dynamics of the ocean within the Earth system and how it responds to changes caused by global phenomena. Changes in the ocean, such as rising sea surface temperatures and sea levels, have far-reaching implications for the entire globe, including its land surfaces.

This school establishes ASU as a leader in field-based ocean research and learning opportunities on the Tempe campus, the Bermuda Institute of Ocean Sciences (BIOS), and in Hawaii.

DESCRIBE STRATEGIC IMPORTANCE OF THE GOAL TO THE UNIVERSITY/ENTERPRISE STRATEGIC PLAN

The College of Global Futures is the heart of the learning space in the Julie Ann Wrigley Global Futures Laboratory, the world's first comprehensive, university-based approach to ensuring a habitable planet and a future where well-being is attainable for all humankind.

Urgent issues across the globe require informed action. Our responsibility is to develop viable options that ensure well-being for everyone.

The ASU Charter tasks us with taking fundamental responsibility for the economic, social, cultural and overall health of our community. The College of Global Futures speaks to the global community, and ASU's conviction to make a meaningful contribution to ensuring a habitable planet and future in which well-being is attainable for all.

DESCRIBE ACHIEVEMENT OF THE GOAL AS ASSIGNED

The achievement toward this goal started by taking an assessment of ASU's independent resources and intellectual expertise and combining them to create a more powerful academic presence in the College of Global Futures. The composition of the College of Global Futures expands expertise and tools to address the most pressing problems, and create a cadre of leaders who are prepared to tackle these challenges.

In the College of Global Futures, students are prepared to address some of the greatest challenges presently, from ensuring the social benefits of powerful new technologies and creating just and sustainable futures, to exploring solutions to emerging issues that transcend the limitations of conventional thinking.

Faculty recruitment:

In AY 2022-23, Global Futures added 15 new faculty members resulting in 140 total faculty across 4 schools, a mix of tenure and career track. As part of the commitment to transdisciplinary collaboration, most of these faculty members split appointments across multiple schools. The newest school, the School of Ocean Futures, has 19 faculty total.

Student Success:

Graduate Success: The 2022 College of Global Futures Employment Survey of alumni indicates 93% of respondents are employed or in graduate school and of those employed 76% have jobs in degree-related careers.

Fall 22 student retention rate is: 91.5%. CGF retention has consistently been higher than the ASU average.

CGF 2023 graduation rate (6 year cohort, immersion) is 84.4%

Degree programs in the new School of Ocean Futures are now enrolling students Ocean Futures (Coastal and Marine Science), BS - School of Ocean Futures (asu.edu)

Enrollment:

Across the academic year, Fall 2023, Spring 2024, and preliminary Summer 2024 (all sessions), there were 2,407 unique students who pursued a College of Global Futures credential in any one of those terms, for a total of 2,554 credentials including undergraduate and graduate majors, certificates, and minors.

For courses taken in the Fall 2023 or Spring 2024, there were 5,049 students taking a course with a subject affiliated with the College of Global Futures. Of these students, 1,932 students were CGF students at the time of the course, and 3,117 students were not CGF students.

New programs:

- Launched Global Futures Impact Scholars Program. Program is **open to in-person learners** for the 2024-2025 academic school year.
- The College of Global Futures continues to formulate programming to round out the knowledge base.
- Multiple new/recently established and approved degree programs are in place. See Appendix #3 for details.

PROVIDE DATA OR OTHER EVIDENCE DEMONSTRATING ACHIEVEMENT

Please see **#3** for data related to enrollment and retention.

SUPPORTING DOCUMENTS:

(#1) Examples of activities led by Global Futures Laboratory Scientists and Scholars:

ASU - Starbucks Center for the Future of the People and the Planet

The ASU-Starbucks Center for the Future of People and the Planet will advance Starbucks' transformative agenda by leveraging ASU's applied research, networks, expert faculty, and innovation through shared aspirational commitment to the betterment of people, the planet and global communities. https://starbucks.corporate.asu.edu/center-for-the-future

BRIDGES

Since 2022, the Julie Ann Wrigley Global Futures Laboratory has proudly served as the lead institutional and scientific partner of the ASU BRIDGES Flagship Hub. BRIDGES is an inclusive coalition of intergovernmental, governmental and non-governmental organizations, institutes and formal networks organized within UNESCO's international science programme Management of Social Transformations (MOST). The coalition is committed to helping higher education and research institutions, in collaboration with non-academic partners, as together they work to address the greatest challenges facing societies during the UN Decade of Action (2021-2030) to deliver the Sustainable Development Goals (SDGs).

Center for Energy and Society

The Center for Energy & Society at Arizona State University was established to put people at the center of the conversation about the future of energy. Over the next few decades, a global energy revolution will fundamentally transform energy systems and infrastructures all over the planet. The ASU Center's goal is to understand those implications and ensure that they are fully accounted for in the decisions made by energy business and policy leaders between now and 2050 as they redesign the world's energy systems. https://ifis.asu.edu/content/center-energy-and-society

Center for Global Discovery and Conservation Science

The Center for Global Discovery and Conservation Science leads spatially explicit scientific and technological research focused on mitigating and adapting to global environmental change. https://gdcs.asu.edu/

Center for Innovation in Informal STEM Learning

The Center for Innovation in Informal STEM Learning is dedicated to improving how people across generations learn science, technology, engineering, and math (STEM). The center works with informal learning organizations, such as museums and libraries, to facilitate public education and conduct applied research. Center projects examine space exploration, climate and environment, socio-technical change,

responsible innovation, citizen science, and storytelling. With strong expertise in science communication, the center animates STEM learning, builds literacy among participants, and democratizes science and technology education. https://pit.asu.edu/center-innovation-informal-stem-learning

Center for Negative Carbon Emissions

CNCE is advancing carbon management technologies that can capture carbon dioxide (CO2) directly from ambient air in an outdoor operating environment. https://globalfutures.asu.edu/cnce/

Global Locust Initiative

ASU's Global Locust Initiative engages key actors in locust research and management to develop partnerships and solutions for transboundary pest management in agroecosystems around the world. https://sustainability-innovation.asu.edu/global-locust-initiative

LightWorks

LightWorks pulls light-inspired research at Arizona State University under one strategic framework. It is a multidisciplinary effort to leverage ASU's unique strengths, particularly in solar-electric energy, sustainable fuels and products, and energy and society. https://sustainability-innovation.asu.edu/lightworks/

Pacific RISA

Funded by the National Oceanic and Atmospheric Administration, the center supports research into how Pacific Island communities can build resilience to extreme climate events.

Sustainable Phosphorus Alliance

In early 2014, participants at the Phosphorus Sustainability Research Coordination Network (P RCN) proposed to create the Sustainable Phosphorus Alliance (SPA) in order to implement sustainable P solutions. The Alliance is North America's central forum and advocate for the sustainable use, recovery, and recycling of phosphorus in the food system. https://phosphorusalliance.org/

Swette Center for Sustainable Food Systems

The Swette Center for Sustainable Food Systems develops innovative ideas and solutions to the many challenges of current food systems. Taking a holistic and transdisciplinary approach, the Center's work encompasses water and energy use, carbon footprint and nutrition, innovations in agtech, and the well-being and livelihood

of farmers and others working in food systems. https://sustainability-innovation.asu.edu/food

Multiple Provost-approved GFL-affiliated centers have been added to the expanding GFL portfolio:

Center for an Arizona Carbon Neutral Economy (AzCaNE)

AzCaNE was founded by four Arizona energy providers and the state's three public universities. The Center was established to create, nurture, and grow a diverse and inclusive ecosystem of stakeholders working together toward a common goal, a carbon-neutral thriving Arizona and desert southwest economy by 2050.

Arizona Water Innovation Initiative (AWII)

The Arizona Water Innovation Initiative was established through funding from the Arizona Governor's Office to provide immediate, actionable and evidence-based solutions to ensure that Arizona will continue to thrive with a secure future water supply. Through this initiative, ASU researchers work with industrial, municipal, agricultural, tribal and international partners to rapidly accelerate and deploy new approaches and technology for water conservation, augmentation, desalination, efficiency, infrastructure and reuse. (source)

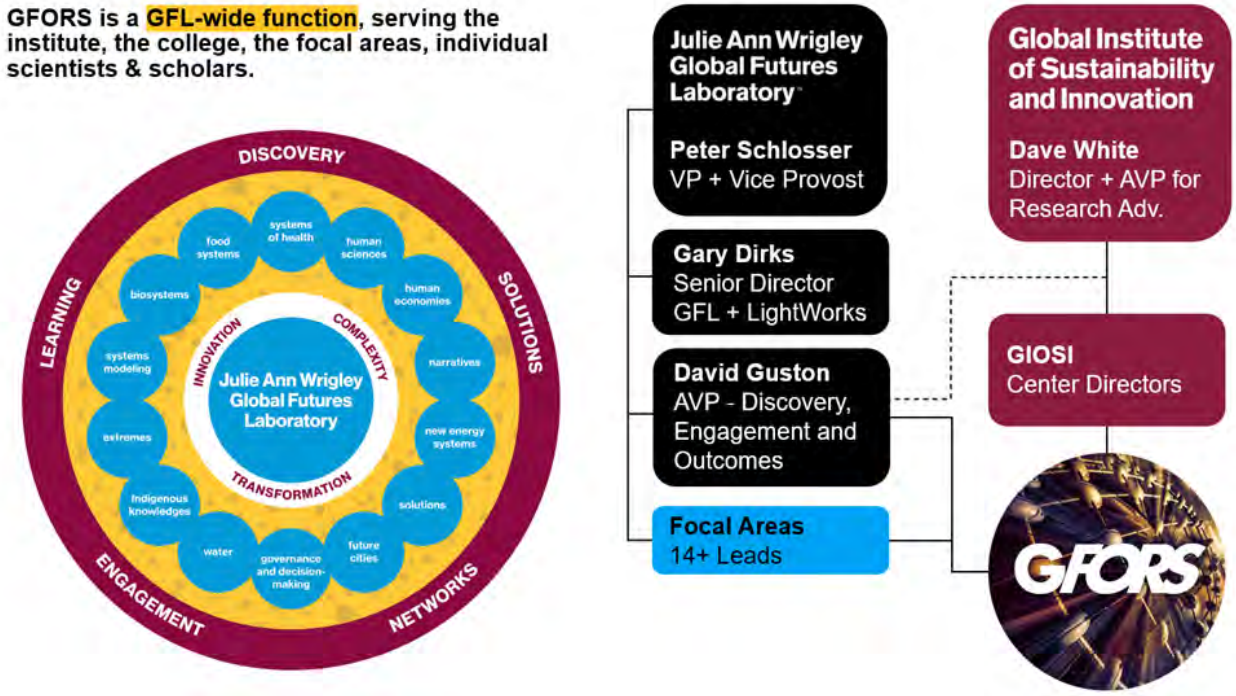
Center for Energy Research and Policy (CERP)

The Center for Energy Research and Policy provides unbiased research, critical analysis and thought leadership on the current and emerging energy issues affecting the Southwest. Housed within Lightworks, a unit of the Global Futures Laboratory, CERP's research and analysis is drawn from in-house competencies in engineering, environmental science, finance, economics and public policy. This multidisciplinary expertise allows CERP to fully evaluate the consequences of current and future energy policy and stimulate robust debate among all stakeholders.

Just Energy Transition Center (JET)

The Just Energy Transition Center works to assist communities, workers and states facing the difficult economic and social consequences of closing coal plants.

(#2). GFSS and GFORS charts



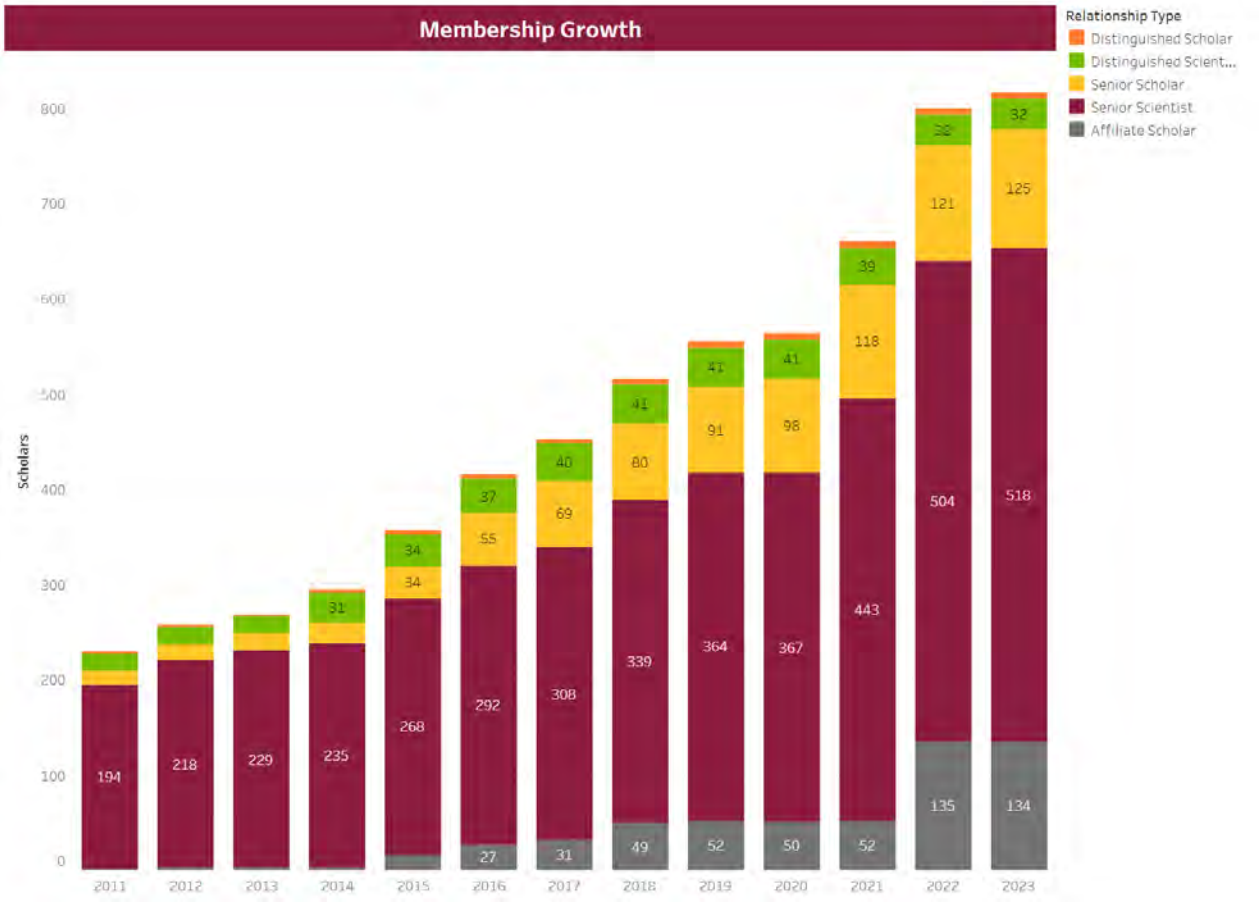
GFSS Proposals, Awards, Expenditures

	2024	2023	2022	2021	2020
Proposals	$426,240,559.49	$788,023,405.74	$873,014,188.51	$641,089,323.78	$504,215,234.14
Awards	$180,091,682.93	$271,403,925.09	$228,948,742.82	$156,006,158.57	$140,322,613.78
Expenditures	$159,782,255.97	$226,469,269.01	$204,060,649.07	$140,368,765.66	$146,429,206.64
Total GFSS	845	810	797	658	563
Active GFSS	483	486	494	419	402
% Active	57%	60%	62%	64%	71%
Proposals/Member	$504,426.70	$972,868.40	$1,095,375.39	$974,299.88	$895,586.56
Awards/Member	$213,126.25	$335,066.57	$287,263.17	$237,091.43	$249,240.88
Expenditures/Member	$189,091.43	$279,591.69	$256,035.95	$213,326.39	$260,087.40

Although numbers of proposals and awards are down (*at this point in the year*), the proportion of unique PIs per proposal is up 13%.

845

Scientists and Scholars



#3. College of Global Futures enrollment

Across the academic year, Fall 2023, Spring 2024, and preliminary Summer 2024 (all sessions), there were 2,407 unique students who pursued a College of Global Futures credential in any one of those terms, for a total of 2,554 credentials including undergraduate and graduate majors, certificates, and minors.

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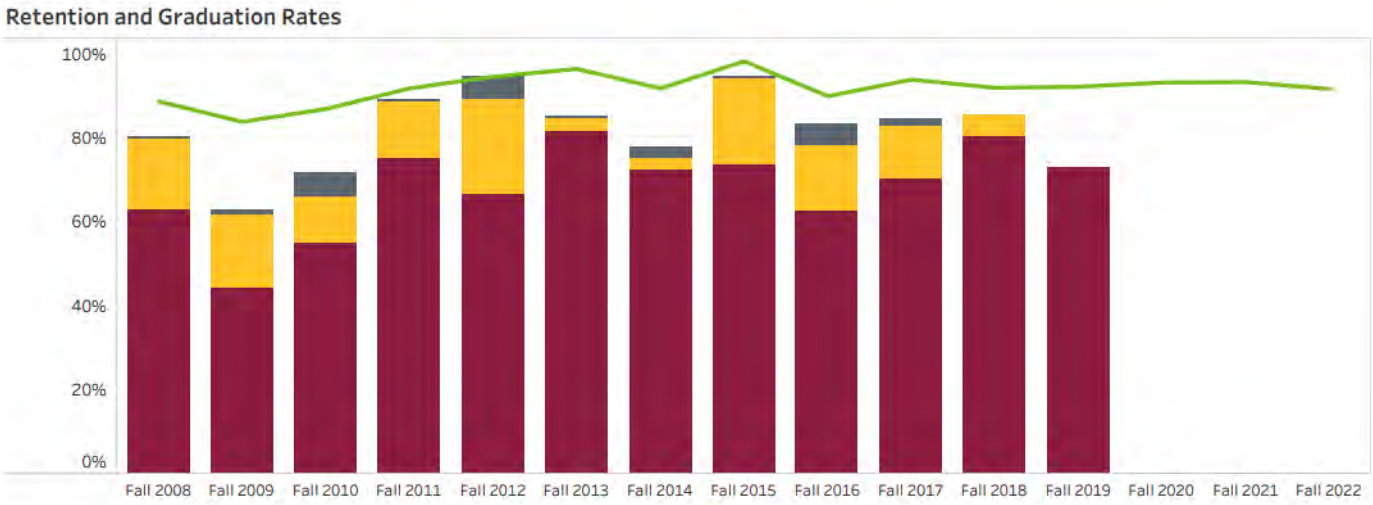

	Fall 2008	Fall 2009	Fall 2010	Fall 2011	Fall 2012	Fall 2013	Fall 2014	Fall 2015	Fall 2016	Fall 2017	Fall 2018	Fall 2019	Fall 2020	Fall 2021	Fall 2022
Cohort	35	86	53	36	36	27	36	53	59	64	61	63	72	73	59
1-Yr Retention Rate	88.6%	83.7%	86.8%	91.7%	94.4%	96.3%	91.7%	98.1%	89.8%	93.8%	91.8%	92.1%	93.1%	93.2%	91.5%
4-Yr Graduation Rate	62.9%	44.2%	54.7%	75.0%	66.7%	81.5%	72.2%	73.6%	62.7%	70.3%	80.3%	73.0%			
5-Yr Graduation Rate	80.0%	61.6%	66.0%	88.9%	88.9%	85.2%	75.0%	94.3%	78.0%	82.8%	85.2%				
6-Yr Graduation Rate	80.0%	62.8%	71.7%	88.9%	94.4%	85.2%	77.8%	94.3%	83.1%	84.4%					

2021-2024 Multiple-Year At-Risk Goal 4

Build and document enhanced regional collaboration in research, with a focus on increased collaboration within Arizona higher education.

Goal Accomplished

Enhanced Regional Collaboration in Research
July 2024

Executive Summary

As the most innovative school and one of fastest growing research enterprises in the nation, Arizona State University (ASU) advances groundbreaking research and translates solutions into impact. With respect to the ASU Enterprise's strategic plan, the university accelerates discovery by bringing the best and brightest minds together through partnerships, commitment to our community, and innovation. Partnerships have increased by 216% since 2010; community engagement is on track to exceed FY23: and innovation metrics have increased as well. The university's strategy to maintain the momentum described in this report is to continue to focus on collaboration, engagement and continuous innovation.

FY24 At-Risk Goal Achieved

Arizona State University advances research and discovery via partnerships, commitment to our community, and innovation as described in the following.

Through powerful partnerships

In FY24, Arizona State University (ASU) researchers collaborated with colleagues from the University of Arizona (UA) and Northern Arizona University (NAU) on nearly 500 awards valued at approximately $576 million. Overall, total award obligations between ASU and ABOR universities have increased by 216% since 2010 *(Table 1).*

Fiscal Year	ASU/NAU	ASU/UA	ASU/UA/NAU	Total
2010	$3,712,041	$17,086,189	$4,242,986	$25,041,216
2011	$2,727,608	$13,340,520	$3,072,462	$19,140,590
2012	$2,837,906	$24,523,511	$1,993,957	$29,355,374
2013	$3,289,978	$34,271,766	$2,307,003	$39,868,747
2014	$2,941,445	$22,477,483	$2,534,196	$27,953,124
2015	$5,406,199	$19,976,917	$3,499,299	$28,882,415
2016	$6,536,414	$22,471,071	$2,296,578	$31,304,063
2017	$9,566,497	$13,486,988	$2,677,041	$25,730,526
2018	$11,969,930	$25,352,957	$5,041,993	$42,364,880
2019	$7,374,112	$28,330,043	$3,465,545	$39,169,700
2020	$9,864,182	$32,064,104	$1,665,215	$43,593,501
2021	$6,623,838	$25,408,493	$1,936,333	$33,968,664
2022	$5,464,266	$23,897,034	$3,198,694	$32,559,994
2023	$9,731,359	$57,179,053	$9,174,378	$76,084,790
2024	$4,849,562	$60,369,519	$13,946,304	$79,165,385
Total	$93,195,337	$421,977,167	$61,051,984	$576,224,488

Table 1: Partnerships with ABOR Universities

The three universities formed the Valley Fever Collaborative to start an integrated, statewide research project to identify, characterize and map hot spots and routes of exposure for infectious disease. Through the Regents' Research and Community Grants, opportunities for collaboration across Arizona public universities have expanded to accomplish more research in critical areas that impact Arizona residents. Examples include:

- **Fighting Cancer in Firefighters:** ASU and UA, in partnership with the Arizona Fire Chiefs Association, are studying the effectiveness of whether blood or plasma donations lower cancer-causing levels in firefighters.

- **Enhancing Arizona's groundwater supply:** ASU, UA, and NAU, in partnership with the Arizona Department of Water Resources and localities, are examining water runoff, suitable locations to recharge this water into groundwater, and where runoff may be directed in the future to address Arizona drought conditions.

- **Smart tree watering to make urban environments more livable:** ASU and UA in partnership with the Arizona Department of Forestry and Fire Management are comparing standard tree watering practices with new techniques that are expected to result in water savings as more urban areas seek to provide heat relief by increasing tree canopy.

ASU has also seen an increase in regional collaborative research. The impact continues to expand as we engage industry, nonprofits and philanthropic organizations. We have seen a 425% growth in obligations from Arizona sponsors since fiscal year 2010 (*Figure 1*).

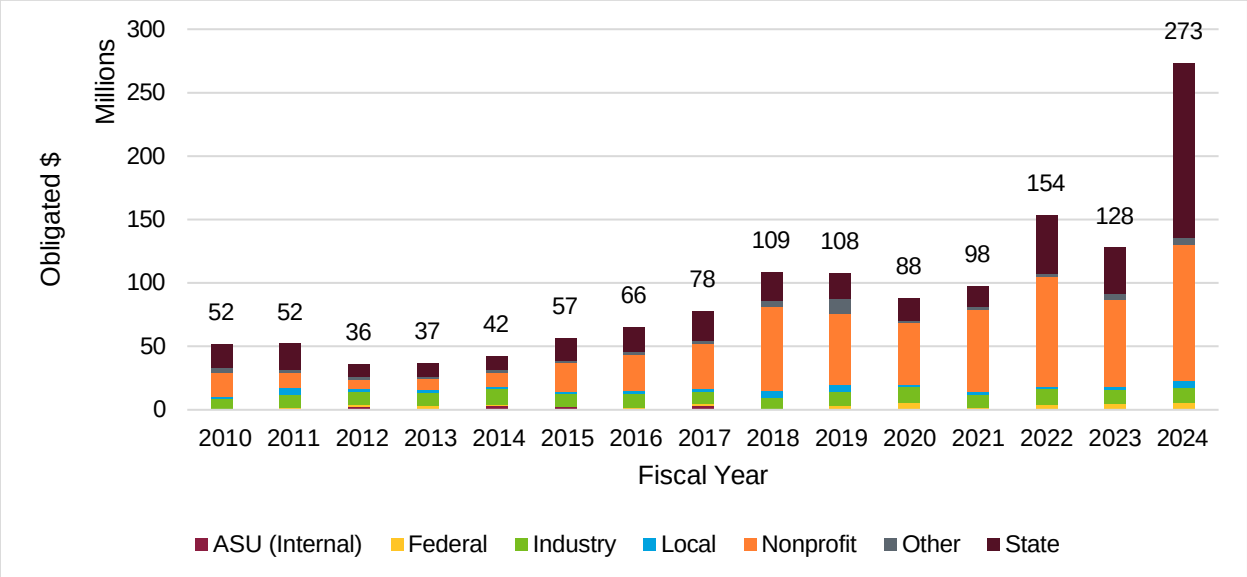

Figure 1: Awards Sponsored by Arizona Funders

ASU has also continued to grow its portfolio of successful partnerships across a broad array of industries including health, microelectronics, advanced technology, and space. Examples include:

Health

The Mayo Clinic and Arizona State University Alliance for Health Care continued its flagship program, the Mayo Clinic and ASU MedTech Accelerator, to empower medical startups to navigate challenges better while bringing forth health innovations. As of FY24, participating companies have raised over $325M in venture capital and employ over 796 people in Arizona and beyond.

The Arizona Community Engagement Alliance Against COVID-19 Disparities (AZ CEAL), funded by the National Heart, Lung, and Blood Institute and the National Institute of Minority Health and Health Disparities, provides $15M in funding from the American Rescue Plan to 11 teams conducting research and outreach to help strengthen COVID-19 vaccine confidence and access, as well as testing and treatment, in communities of color. This is a collaborative effort among ASU, NAU, UA, and Mayo Clinic. AZ CEAL, led by the Southwest Interdisciplinary Research Center at ASU, utilizes community-based participatory research to improve health outcomes, address health disparities, and reduce misinformation in communities disproportionately impacted by COVID-19.

ASU is working with the Vice Presidents of Research at NAU and UA, ABOR, and leadership at Arizona Department of Health Services (ADHS) to identify areas within the 2021-2025 Arizona Health Improvement Plan (AzHIP) where the three universities can join to have measurable impact and improve the health of Arizonans. ASU hosted a workshop this spring regarding this effort. Areas under consideration include telehealth for rural and underserved communities, improved access to care for pregnant and postpartum women, and expanding broadband infrastructure and data capabilities in Tribal communities.

ASU is also leading efforts to manage implementation teams for the pandemic recovery and resiliency plan (PRR), a sub-plan of the AzHIP. These implementation teams include stakeholders from ASU and UA, as well as clinical, government, and community representatives. The goal of the PRR is to bring people together across the state to help Arizona recover from the COVID-19 pandemic and build more resilient communities, systems, and infrastructure as SARS-CoV-2 becomes endemic and we face future threats, including but not limited to emerging infectious diseases. As ASU concludes work on this portion of AzHIP, numerous deliverables, reports, and tools relating to health innovation and technology, maternal health, youth, health promotion, community connection, assessments, and public health communications have been completed and shared with stakeholders.

The Arizona COVID-19 Genomics Union, comprised of ASU, NAU, UA, and the Translational Genomics Research Institute (TGEN) worked together to sequence the SARS-CoV-2 viral

genome to track existing and emerging variants of concern and variants of interest as part of a broader, public health surveillance effort sponsored by ADHS and the CDC.

ASU recently provided a Letter of Support and commitment to be a collaborator to UA for their proposal for a Clinical and Translational Science Award (CTSA) to develop the Southwest Center for Advancing Clinical and Translational Innovation (SW CACTI). As UA pursues the CTSA opportunity with the University of New Mexico Health Science Center (UNM), ASU will leverage existing synergies with UA and UNM, including the Phoenix Bioscience Core, the Mountain States Community Engaged Dissemination and Implementation program, the Arizona Community Engagement Alliance, and the National Drug Abuse Clinical Trials Network – Southwest Node.

ASU's Dissemination and Implementation Affinity Network (ASU D&I AN) leads the Mountain States Partnership for Community-Engaged Dissemination and Implementation Science (MS-CEDI), a collaboration between dissemination and implementation scientists from ASU, UA, UNM, Colorado State University, Johns Hopkins Center for Indigenous Health, Mayo Clinic, and the University of Utah. The MS-CEDI program provides inter-institutional training, grant development, and capacity building opportunities in dissemination and implementation sciences.

Technology

ADHS has funded ASU to engage UA, NAU, and TGEN North to design and implement a state-level pathogen genomics platform that will support broadly integrated data analysis, research, and testing centered around viral, bacterial, and fungal pathogens. In addition to platform development, project proposals will be solicited from tri-university partners and funded based on alignment with public health needs. Once the platform is in place, future phases will integrate other data elements such as information from wearables, EMR, imaging, and more along with added tools for further integrated analysis and research.

The Quantum Collaborative, a regional initiative led by ASU, includes several major national and international partnerships – IBM, Google, Dell and others - and fosters new technology development and workforce development in Arizona, and across the nation, in quantum information science and technology. With the initiative entering its third year, over forty industry, academic, and national laboratory partners are on board and collaborating on a variety of projects. For example, ASU and UA are also integrating their quantum information science and technology initiatives working with organizations such as Oak Ridge and Sandia National Laboratories on funded projects that involve advancing quantum communication. The initiative has garnered funding from a variety of federal agency, foundation, and industry organizations. This affords significant competitive advantages when pursuing the largest-scale funding opportunities available through Department of Energy, National Science Foundation, Department of Defense, and other federal agency programs.

The ASU, UA, and NAU research offices and libraries collaborated to develop a state-level open access policy for research data in response to new regulation being implemented by federal agencies. Once fully implemented, this policy represents a competitive advantage for all proposals submitted.

ASU and NAU have been funded by the Flinn Foundation to establish research data infrastructure and capability for Valleywise Health and a data-enabled research strategy initially focused on the health of Arizona's refugee populations.

ASU, NAU, UA and ADHS collaborated on an ASU-led engagement with Contexture supported by the Northern Arizona Regional Behavioral Health Authority (NARBHA) Foundation and centered around pathing toward use of the state's health information exchange (HIE) data for public health and eventually research. Contexture recently indicated interest in initiating a next phase of this work, having acted on many of the recommendations presented after the original phase. The next phase involves developing the specific governance and infrastructure solutions needed to support new collaboration between not only the tri-universities and HIE but also many members of the HIE's base of over 1,000 Arizona provider organizations.

ASU and the Sun Corridor Network co-funded the strategic hire of a research computing and data network facilitator dedicated to broadening the participation of Sun Corridor Network and other Research and Education Networks amongst geographically dispersed and tribal communities in the state.

ASU and UA are collaborating on the development of the NSF-funded Jetstream2 regional private computing cloud, providing advanced artificial intelligence (AI) capabilities for researchers at no cost. Several popular open source AI models are being ported to the Arizona Jetstream2 cloud with engagement and training activities being held at both campuses.

Microelectronics

ASU is continuing to position Arizona as a national center for the semiconductor industry in a variety of avenues. Partnerships with over 130 companies, including Applied Materials, NXP Semiconductors and Taiwan Semiconductor Manufacturing Company (TSMC), resulted in over $300M in newly committed funding over the next few years. TSMC is also investing $1M in ASU to fund microelectronics research projects and create lab programs and a symposium for students and faculty to showcase their work and network with TSMC's employees.

Led by ASU, the Southwest Advanced Prototyping (SWAP) Hub is one of eight regional innovation hubs established under the Department of Defense's (DOD) Microelectronics Commons, a national strategic initiative to accelerate the development and production of microelectronics technologies that are critical to U.S. security and defense. Funded by a $39.8 million initial DOD investment, the SWAP Hub is one of the first awards under the CHIPS and Science Act of 2022, which aims to revitalize American semiconductor manufacturing capacity and competitiveness.

As the SWAP Hub lead, ASU leverages its ability to convene and engage with stakeholders across diverse sectors. The SWAP Hub's more than 130 regional and national partners work together to accelerate the lab-to-fab transition between research, development and production, and collaborate to build the microelectronics workforce of the future through curriculum development, learning opportunities and job pathways.

Space

ASU continued engagement in various space missions in flight or development in partnership with NASA and other ABOR universities. ASU and NAU, with sponsorship from the University of Colorado Boulder's Laboratory for Atmospheric and Space Physics (LASP), continue their collaboration on the Emirates Mars InfraRed Spectrometer (EMIRS) for the Emirates Mars Mission, focusing on instrument operations, pipeline development, and scientific and apprenticeship activities. In relation to the UA-led NASA OSIRIS-Rex Sample Return mission, ASU has secured a sub-contract for the analysis of the returned samples. Additionally, ASU and UA are collaborating on the NASA-funded Terahertz Intensity Mapper project, which involves a balloon-borne far-infrared imaging spectrometer. ASU and UA also contribute to the NASA Jet Propulsion Laboratory mission, the Spectro-Photometer for the History of the Universe, Epoch of Reionization, and Ices Explorer. Further, the UA leads the Arizona NASA Space Grant Program, with ASU and other institutions including NAU and Embry-Riddle Aeronautical University participating in this statewide initiative to support student research internships.

Through our commitment to the community.

The New Economy Initiative (NEI) is helping ASU to build and strengthen the Arizona economy of the future by expanding educational and training opportunities and industry partnerships. In FY23, NEI-associated faculty had 67 unique industry partners along with $63.9M in expenditures. For Fall 2022 and Spring 2023 proposal cycles, NEI's STCs recommended for funding 33 projects co-funded with industry, which expect company investment of $2.2M. Initial FY25 estimates showed that NEI-associated faculty had 63 unique industry partners along with $76.4M in expenditures. ASU's MacroTechnology Works (MTW), located in the ASU Research Park, is home to startups and corporate partnerships and plays a key role in enabling Arizona and the nation lead in the microelectronics and semiconductor industry. In FY24, ASU and Applied Materials Inc. forged a partnership to establish the Materials-to-Fab (MTF) Center, a cutting-edge research, development and prototyping, and training center located in MTW. The MTF Center is a place for collaboration – an environment not only for ASU and Applied Materials, but also NAU and UA, other industry and government partners, startups and academic institutions working to fast-track innovation from concept to fab prototype. Equipped with state-of-the-art manufacturing equipment, including industry-relevant 300mm production tools, the MTF Center will enable rapid commercialization of research, accelerate innovation and provide opportunities for hands-on learning that builds the microelectronics workforce.ASU is working closely with the Centers for Disease Control and Prevention (CDC), Phoenix Children's Hospital (PCH) and Valleywise Health (VWH) to monitor the immunogenicity and the

efficacy of vaccines for both COVID-19 and influenza considering the ever-changing nature of these viruses, with a particular interest in addressing disparities experienced by underserved populations.

Through innovation

As of FY24, ASU has cumulatively secured more than 1,600 U.S. patents and, through Skysong Innovations (SI), facilitated the launch of more than 250 companies that have launched to bring ASU innovations to market. Together, these ASU startup companies have attracted more than $1.3 billion in external venture capital and other funding. In FY24, SI secured more than 170 new U.S. patents, putting ASU on track to remain within the top 10 for patents according to data published by the Association of University Technology Managers (AUTM) and within the top 15 for patents among universities worldwide according to the National Academy of Inventors (NAI). All of these metrics exceed or are similar to those in FY23.

ASU's technology transfer activities bolster the state's economy. According to an economic impact study performed by Rounds Consulting Group, "The cumulative efforts of Skysong Innovations spanning a decade, from FY14 to FY23, have generated nearly $2.5B in economic activity in Arizona." This economic activity included "13,270 job-years from FY14 to FY23 (this is equivalent to an average of 1,327 persons working full-time each year over the 10-year period)" as well as "$846.3M in labor income" and "$80.7M in state and local taxes." In its report, Rounds projected, "Over the next decade, from FY24 to FY33, Skysong Innovations activity is projected to produce nearly $3.4B in economic activity throughout Arizona."

2021-2024 Multiple-Year At-Risk Goal 5

Submit a report that demonstrates substantial expansion of ASU Digital Prep within Arizona to at least 150 schools, with a focus on rural and underperforming schools.

Goal accomplished in first year

ASU Preparatory Academy within Arizona

Goal: substantial expansion within Arizona to at least 150 schools, with a focus on rural and underperforming schools.

Executive Summary

This report presents the results of the 2021-2024 at-risk goal for substantial expansion of ASU Preparatory Academy in Arizona. With a focus on rural and underperforming schools, the goal was to partner with at least 150 schools. As of June 2024, ASU Prep has exceeded the goal by 44, with 193 Arizona K-12 partnerships now expanding accessibility to excellent learning opportunities throughout Arizona.

ASU Prep Academy (ASU Prep) is an innovative, tuition-free public charter school network, serving students from Pre-K to grade 12. Within Arizona, across the U.S., and around the world, we partner with innovative school leaders who are eager to design new learning opportunities for today's students.

Founded in 2008, ASU Prep originally operated as University Public Schools, Inc. (UPSI), opening its first campus in Mesa, Arizona. ASU Prep opened its downtown Phoenix location just one year later, in collaboration with the Phoenix Elementary School District, and began moving its Mesa location to ASU's Polytechnic campus that same year.

In 2016, a third location opened in Casa Grande, Arizona, in collaboration with Barça Residency Academy. In 2017, ASU Prep Digital launched, building on the same college preparatory framework with online class offerings available for part–or full–time students globally. In 2018, ASU Prep merged with Phoenix Collegiate Academy, beginning operations as ASU Prep South Phoenix Primary/Intermediate and High School campuses. The newest location, ASU Prep Pilgrim Rest, opened August 2022 for grades PreK-6.

Having designed and pioneered multiple hybrid and online models, ASU Prep now serves as an innovation partner to schools and districts everywhere. We help inventive educators create high-impact, high-quality digitally supported learning environments to meet the unique needs of all learners and teachers. Drawing from ASU Prep's substantial experience in designing flexible learning models, ASU Prep helps educators effectively integrate flexible learning models with industry leading education technologies.

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ASU Prep offers:

- **Digital Course Licensing,** a suite of middle and high school courses, available for fully online or blended environments.
- **University Courses,** allowing high school students to earn university credit and accelerate their pathway to college and career.
- **Professional Development,** offering customized online or in-person training to help teachers thrive in adopting new digital, blended, hybrid, and tech-rich instructional practices.
- **Global Academy** providing online instruction for grades 6-12, delivered by expert digital teachers, to address staffing gaps, special needs, and acceleration demands, and to expand learning choices.

Impact on ASU Strategic Enterprise Plan

Arizona State University is committed to taking fundamental responsibility for the communities it serves. ASU Prep shares this commitment by demonstrating all students can achieve at the highest levels, regardless of socioeconomic status, with the right tools and support. The expansion initiative is of strategic importance to the university's broader mission and enterprise plan, as it:

- **Expands Excellence and Accessibility**: Enhances opportunities for Arizona high school graduates by providing access to high-quality education.
- **Local Impact and Social Embeddedness**: Strengthens the university's presence and influence in local communities, particularly in underserved regions.

Achievement and Progress

- **Goal Achievement**: As noted Prep exceeded the target by collaborating with 193 school partners.
- **Student Impact**: 5,576 part-time learners are being served through digital teaching and learning school partnerships, in addition to 8,000 full-time academy students.
- **Focus on Rural and Underserved Schools**: Of the part-time learners, 3,370 are from rural and underserved schools.
- **Teacher Training**: Since 2020, 20,885 teachers from 1,561 Arizona schools have been trained through the ASU Prep Digital Arizona Virtual Teaching Institute.

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Administrative, Personnel, and Policy Changes

- **COVID-19 Pandemic Response**: The pandemic accelerated the need for statewide partnerships, requiring a rapid and flexible approach. Over the past two years, ASU Prep has significantly enhanced its infrastructure, with staff growing from 419 in 2019 to 957 in 2024, to support our school network and our Arizona and national partnerships effectively.
- **Expanded learning options:** As many schools reverted back to business as usual after the pandemic, we recognized an opportunity to re-engage students in new ways. While many students longed to be face-to-face with their peers again, they also did not want to lose the benefits they had realized from online learning. Likewise, students in fully online programs voiced a desire for more time with their peers, face-to-face. By listening closely to student and family feedback, ASU Prep expanded their learning models in several ways. For example:
    - ASU Prep designed two microschool models, one with an even split of time between online and face-to-face learning, and another where students meet predominantly online but have opportunities to engage in projects and activities on the ASU campus or in field trips at least one day weekly.
    - ASU Prep is now expanding hybrid learning to their traditional school sites with a “flexible Friday” model that allows students and families to choose their learning mode.
    - The Math Momentum programming, which originated with Prep’s own students, has expanded to multiple partnerships to target specific needs and raise math achievement statewide.

  These innovations and more are designed, piloted, and tested with our own students. We then work with partners to design similar solutions for their specific needs, and we leverage their insights and suggestions to improve programming, iterate new versions, or design new models.

- **Resource Allocation**: Increased investments in digital infrastructure, including increases in our data security strategy and technologies, along with additional administrative support for our Learning Management System and support services, have been crucial in meeting the expanded needs of partner schools and students. Investments in our network infrastructure, such as the buildout of a “Learning cloud” to house our new modular content or even the implementation of a more robust HR management tool (WorkDay), bolster our ability to support partners.

Maintaining Momentum

Strategic Initiatives for the Upcoming School Year

1. **High School Core Courses**: Offering high school core courses at no cost to any rural or Title 1 school district in Arizona, ensuring equitable access to quality education.
2. **8th Grade Math Tool (Digit)**: Making the Digit math tool widely available, with Algebra 1 content powered by ASU Prep's AI engine, Archie, set to pilot statewide in the fall.
3. **Professional Learning Community (PLC) Sessions**: Collaborating with Project Momentum and the Arizona Department of Education (ADE) to offer weekly virtual PLC sessions to teachers in D/F school districts, providing job-embedded coaching and support, especially for singleton teachers in rural areas.

Additional Considerations

ASU Prep's flexible and responsive approach to the challenges posed by the COVID-19 pandemic laid a strong foundation for ongoing success for our own students and for our partners. Not content to rest on past achievements, ASU Prep has built a culture of curiosity and disruptive innovation, designed to encourage our team to continually remove barriers to learning or advancement. We encourage our staff to scrutinize learning systems and environments to determine whether or not they engage, support, retain, and accelerate learners.

ASU Prep extends this culture of curiosity and continuous improvement extends to partnerships. Just as any gifted teacher will look for formative feedback to determine if students are learning, feedback from our partners provides invaluable insights to support iterative improvements to any service, learning model, or product.

Today, as we grow partnerships, leverage AI and other emerging technologies, and support teacher development, ASU Prep is well-positioned to build upon the achievements of the past three years. Through these efforts, ASU Prep remains dedicated to fostering educational excellence and equity throughout Arizona, aligning with the university's strategic goals and contributing to the broader mission of supporting underserved communities.

Data and Evidence

ASU Prep enjoys partnerships with a wide range of schools and districts in regions through the state. Of our 193 partnerships, 28.86% represent schools in rural areas, Title 1 schools/districts, or both.

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Partnership	District/Parent Org	Number of Schools	Rural	Title 1
Tempe Elem School District 3	Tempe Elem SD 3	4		
Brophy College Prep HS	Diocese of Phoenix	1		
Bourgade Catholic High School	Diocese of Phoenix	1		
Miami Jr Sr High School	Miami USD	1		
North Valley Christian Academy	Private	1		
Arizona School for the Arts	AZ State Board for Charters	1		
Blue Ridge High School	Blue Ridge USD	1		
Yuma	Yuma Un HSD	5		
Chandler Unif School Dist 80	Chandler USD	15		
Herberger Young Scholars Academy	Private	1		
Desert Garden Montessori Sch	Private	1		

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Desert View Middle School	**AZ State Board for Charters**	**1**		
Desert View Online High School	**AZ State Board for Charters**	**1**		
Mountainside High School	**Nadaburg USD**	**1**		
Nogales High School	**Nogales USD**	**1**		
Pendergast District-Wide HS	**Pendergast ESD**	**12**		
St David High School	**St. David USD**	**1**		
San Luis High School	**Yuma Un HSD**	**1**		
San Carlos High School	**SCAT/Access ASU grant**	**1**		
Desert Oasis Elementary School	**Nadaburg USD**	**1**		
Tempe Preparatory Academy	**AZ State Board for Charters**	**1**		
Arts Academy Estrella Mountain	**AZ State Board for Charters**	**1**		
Morristown Elem Sch Dist 75	**Morristown ESD**	**1**		

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Notre Dame Preparatory HS	Diocese of Phoenix	1		
Bourgade Catholic High School	Diocese of Phoenix	1		
Loretto Catholic School	Diocese of Tucson	1	•	•
Sahuarita Online Academy	Sahuarita Unif School Dist 30	1	•	•
Salpointe Catholic High School	Diocese of Tucson	1	•	•
Seton Catholic Prep High School	Diocese of Phoenix	1	•	•
St. John Paul II High School	Diocese of Phoenix	1	•	•
Desert Garden Montessori Sch	Private	1	•	•
Arizona Cultural Academy	Private	1	•	•
Queen of Peace Catholic School	Diocese of Phoenix	1	•	•
Faith Lutheran School	Diocese of Tucson	1	•	•

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Sierra Middle School	**Sunnyside USD**	**1**	•	•
Tuba City High School	**TCUSD**	**1**	•	•
Greyhills Academy HS	**AZ State Board for Charters**	**1**	•	•
Mexicayotl Academy	**AZ State Board for Charters**	**1**	•	•
City HS (Tucson)	**AZ State Board for Charters**	**1**	•	•
Red Mesa Elementary	**RMUSD**	**1**	•	•
Round Rock Elementary	**RMUSD**	**1**	•	•
Salome Elementary	**SESD**	**1**	•	•
Scottsdale Middle Schools	**Scottsdale Unif Sch Dist 48**	**3**	•	•
Joseph City Schools	**JCUSD**	**2**	•	•
Vernon Elementary	**VESD**	**1**	•	•
La Paloma Academy – Lakeside campus	**LPA**	**1**	•	•

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Taylor Made Prep Academy	TMPA	1	•	•
Empowerment Academy		1	•	•
Hope Academy HS	Maricopa Co RSD	1	•	•
First Star ASU		28	•	•
Tempe Summer Math/Science	Tempe Un HSD	4	•	•
Peoria MET (serves 7 high schools)	Peoria Unified School District	7	•	•
Great Hearts Academy Anthem		1		
Sonoran Sky Elementary		1		
Pendergast Elementary School District	PESD	1		
San Luis High School	YUSD	1		
Tuba City High School	TCUSD #15	1		
Greyhills Academy High School	BIE	1		
City High School		1		

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Arizona School for the Arts		1		
Arizona Autism Charter School		1		
Arts Academy Estrella Mountain		1	•	•
Salpointe Catholic High School		1	•	•
Greenways Academy		1	•	•
ASU TRIO		5	•	•
Notre Dame Preparatory HS		1	•	•
Shonto Prep Tech HS		1	•	•
Arizona Cultural Academy		1	•	•
Bourgade Catholic High School		1	•	•
Apache Junction Unified School District	AJUSD	6	•	•
Santa Cruz Unified School District	SCUSD #35	6	•	•
Kyrene Unified School District	KUSD	3	•	•

St. John Paul II High School		1	•	•
Total		169	•	•

Math Momentum Partnerships			Rural	Title 1
Avondale Virtual Innovation Academy	Avondale ESD	1	•	•
Desert Sands Middle School	Cartwright ESD	1	•	•
Willis Jr High	Chandler USD	1	•	•
Cedar Hills Elementary	Hackberry USD	1	•	•
Glassford Hill Middle School	Humboldt USD	1	•	•
Coyote Springs Elementary	Humboldt USD	1	•	•

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Lake Valley Elementary	Humboldt USD	1	•	•
Westwood High School	Mesa Public Schools	1	•	•
Mobile Elementary School	Mobile ESD	1	•	•
Amberlea Elementary	Pendergast ESD	1	•	•
Pendergast District Wide Alg/Geo	Pendergast ESD	1	•	•
Sonoran Sky Elementary	Pendergast ESD	1	•	•
Phoenix iAcademy	Phoenix ESD	1	•	•
Phoenix ESD Algebra I Program	Phoenix ESD	1	•	•
Maxine O Bush Elementary	Roosevelt ESD	1	•	•

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Ignacio Conchos Elementary (6,7,8)	**Roosevelt ESD**	**1**	•	•
Davis Elementary	**Roosevelt ESD**	**1**	•	•
Ed and Verma Pastor Elementary School	**Roosevelt ESD**	**1**	•	•
RSD District Algebra I/Geo Program	**Roosevelt ESD**	**1**	•	•
Salome Elementary	**Salome Consolidated ESD**	**1**	•	•
Stanfield Elementary	**Stanfield ESD**	**1**	•	•
Round Rock K-8	**Red Mesa USD**	**1**	•	•
Red Mesa K-8	**Red Mesa USD**	**1**	•	•
Villa Montessori	**Villa Montessori**	**1**	•	•

Desert Foothills Jr. High (Algebra I)	**Washington ESD**		•	•
Total		**24**		

ANNUAL DISCLOSURE STATEMENT OF AFFILIATIONS
AND
OUTSIDE COMPENSATION
FOR PRESIDENT

Arizona Board of Regents Policy 6-1101 and the president's employment require annual disclosure of all organizations with which the president is affiliated and all outside compensation received. Outside compensation includes any consideration related to outside board affiliation, consulting or other services, or provided by a university foundation or university-affiliated entity. However, presidents are not required to report personal and passive investment income.

Please complete this disclosure form, and update this form throughout the applicable fiscal year as information changes.

Board appointments, including current and anticipated appointments and any related compensation, excluding payments for honoraria and speaking engagements: ***(If no appointment or compensation, state "none.")***

Name of Organization	Amount of Compensation (if any)
Worktiva (Director) - software technology	~$70,000 & annual stocks
In-Q-Tel (Director & Chair)	~$40,000

Outside employment, consulting relationships and related compensation, excluding payments for honoraria and speaking engagements: ***(If no employment, consulting relationship or related compensation, state "none.")***

Name of Outside Employer or Name of Entity Receiving Consulting Services	Amount of Compensation (if any)
Speaking	All fees to ASUF
Royalties	All fees to ASUF

Other organizations with which the president is affiliated and any outside compensation not otherwise identified above:

Name of Organization	Amount of Compensation (if any)
ASU Foundation President's Leadership Chair	**$200,000**

Signature of President Michael Crow

Date 8-9-24

Printed Name of President Michael M. Crow