

September 2023

GEORGIA PATHWAYS

M A G A Z I N E

Small Business Growth & AI
Microsoft Corp.

The STEM *6*
A Paradigm Shift

AI

Partnership for Inclusive Innovation

Fall Education Events

The Technology Association of Georgia Education Collaborative (TAG-Ed) strengthens the future workforce by providing students with relevant, hands-on STEAM learning opportunities and connecting them to Technology Association of Georgia (TAG) resources. Formerly the TAG Foundation, TAG-Ed is a 501(C)(3) non-profit organization formed by TAG in 2000. Later, the organization's name was re-branded to TAG Education Collaborative to facilitate our role as the leaders for K-12 STEAM education in Georgia.

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Georgia Pathways Magazine services the STEAM education industry needs of the state of Georgia. This magazine is viewed by the consumer with the understanding that the information presented is from various sources from which there can be no warranty or responsibility by the Technology Association of Georgia, the Technology Association of Georgia Education Collaborative and/or their affiliates as to legality, completeness or accuracy.

Small Business Growth & AI
MICROSOFT

Georgia Public-Private Partnership
PARTNERSHIP FOR INCLUSIVE INNOVATION

Big Science - Young Minds
SUMNER S BROWN GIBBS / ORNL

Ocean Exploration
NAUTILUS LIVE

The STEM 6
ELIZABETH ALEX

Water Innovations
HOUSTON SPENCER / XYLEM

Welcome to the September 2023 edition of Georgia Pathways Magazine.



Two decades ago, the way we live and work looked vastly different than the technology-driven ecosystem we navigate today. This evolution amplifies the demand for not only engineers and scientists but also problem solvers and creative thinkers. As such, STEAM education is constantly changing in order to foster the next generation of innovators.

But what does this change mean for educators? To keep up with a world in flux, educators are often asked to rethink the ways in which they prepare students to enter the workforce of tomorrow. It's no longer just about teaching information, but about ensuring that knowledge remains relevant to real-world scenarios.

As we enter a new school year, it's essential to stay ahead of the curve and embrace emerging trends in STEAM education. Here are just a few areas in which we're seeing shifts:

- **Real-World Applications:** Today's STEAM education transcends the confines of theory. It's becoming more hands-on, mirroring real-life situations. This practical approach not only enhances students' comprehension but also aids in the retention of the concepts they learn in the classroom.
- **Personalized Learning:** Central to STEAM is its inherent adaptability to cater to diverse learning styles. Recognizing that students resonate with different learning approaches, there has been a shift towards more personalized, project-based strategies in STEAM education.
- **Cybersecurity and AI Education:** Our increasing reliance on technology necessi-

tates a robust understanding of cybersecurity. As digital interactions become a core part of our daily lives, equipping students with knowledge in cybersecurity is critical. Anticipating this need, educators have started incorporating cybersecurity lessons as staples in their curriculum. Simultaneously, with the rise of artificial intelligence, AI education is emerging as an essential component of tech-savvy curricula, further cementing the importance of tech literacy for students.

- **Inclusivity, Diversity, and Equity:** The STEAM domain, historically, has had challenges when it comes to representation. However, recent years have seen positive strides towards a more inclusive workforce. An instrumental strategy in this pursuit is ensuring equity in STEAM education, thus enabling students from diverse backgrounds to obtain the skills they need to thrive in these careers.

As we continue to see STEAM education evolve, let's work together to foster learning environments that are dynamic, inclusive, and primed for the challenges of tomorrow.

Larry K. Williams
President
TAG / TAG-Ed

Larry K. Williams serves as the President and CEO of the TAG and the TAG Education Collaborative. TAG-Ed's mission is to strengthen Georgia's future workforce by providing students with relevant, hands-on STEM learning opportunities by connecting Technology Association of Georgia (TAG) resources with leading STEM education initiatives.

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1 Source: US Bureau of Labor Statistics

KEY FEATURES



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Share this issue with your students, peers, parents and industry professionals you know. Make this a new monthly connection for curiosity, interaction, college prep and career development.

Many parents really enjoy this content as they too pursue their personal life-long learning goals.

Local industry and government leaders need to know about this resource as their future employees decide and prepare how to spend their careers.

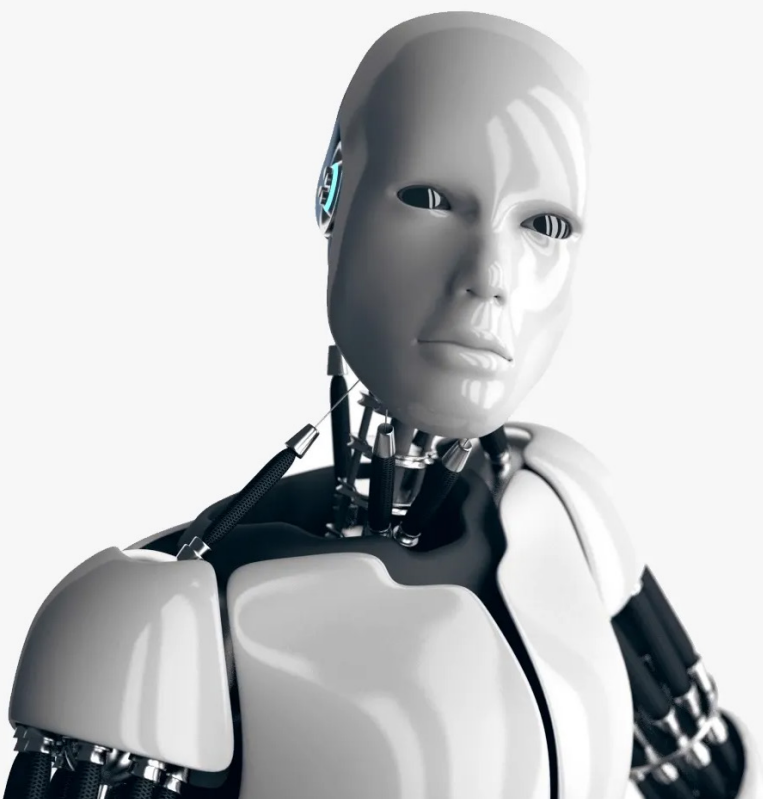
Small Business Growth in the Age of AI

Trends, opportunities and challenges

AI is revolutionizing how businesses operate by allowing machines to learn and solve problems in ways similar to humans. With the help of conversational AI (humans talking to chatbots and virtual agents) machines can now communicate with humans in a natural and human-like way.

Meanwhile, generative AI can create content that closely resembles human-made work. Bing Chat, Chat GPT, and Google Bard are examples of AI-powered intelligent interactions that utilize both types of AI. We use AI in our daily lives without even realizing it. The autocorrect feature in our phones, recommendations from our favorite e-commerce sites, the ads we see when streaming videos, and the optimization of delivery routes from our favorite carriers are powered by some form of AI.

One of the most significant benefits of AI is its ability to automate repetitive and time-consuming tasks, freeing up employees to focus on more complex and high-level work. AI can also help businesses make more-informed decisions by analyzing vast amounts of data and providing actionable insights. However, there are also potential downsides to consider, such as data privacy, compliance, bias in decision-making, or the potential for job loss due to automation.



We created this document to get you started on a journey to the responsible use of AI to empower your business.

77% of Individuals use a service or device that is AI-powered

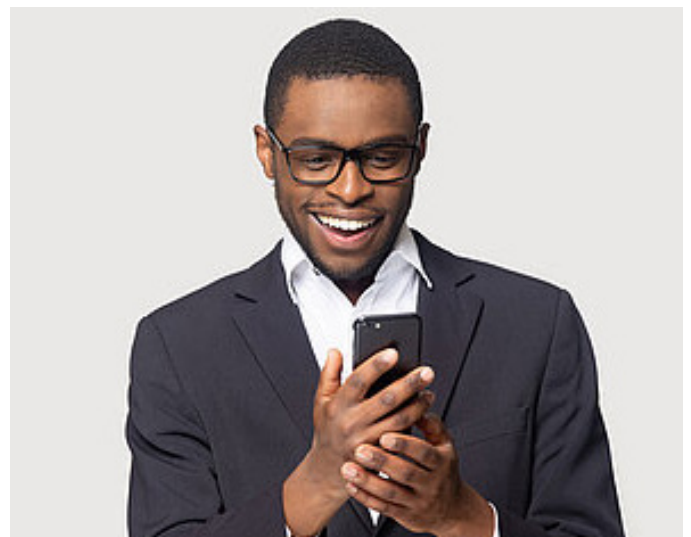
Small Businesses (SBs) in the United States are the heart of the economy and are embracing AI at a rapid pace to help them reduce costs; increase revenues; facilitate decision making; and hire, develop, and retain team members.

To better understand the challenges and opportunities of AI for SBs, we commissioned a comprehensive analysis—based on focus groups with small businesses, analysis of research published by world-leading research organizations, and direct surveys—of a balanced sample of 550 businesses with less than 250 employees across the 50 states. Respondents were between the ages of 24 and 75. 46 percent identified themselves as female, 47 percent as male, and 7 percent as other. In addition to our SB research, we analyzed over 8,000 AI tools, apps, and companies that cater to the needs of the SB sector.

SBs are rapidly embracing AI and are satisfied: 72 percent of SBs in the United States are familiar with AI solutions. Half actively use and enjoy them, with

a 72 percent satisfaction rate. These businesses use AI to automate marketing, sales, and customer interactions; streamline business operations; and enhance analytics and finance automation.

They also utilize AI tools for employee recruitment, retention, and scheduling. Focusing on three priorities in 2023-2024: The adoption of AI focuses on three key areas including revenue growth, cost savings, and talent management and retention. Reskilling the workforce is a priority: Half of SBs in the United States expect that some job functions will be reduced due to the automation of repetitive tasks. This could impact around three million individuals, making it crucial to consider ways to reskill and re-deploy them in other capacities to meet business needs and demands. Growing pains related to compliance, privacy, and skills: SBs seek guidance to fully utilize AI due to challenges like compliance, privacy, skills, and integration with existing processes and tools.





Influencing Factors for AI adoption include: 1) Ease of use, 2) Integration with existing software solutions, 3) Skills 4) Pricing 5) Free trials, and 6) Help with data privacy and compliance issues. AI creators are empowering SBs: With over 8,000 AI tools developed by these creators, spanning more than 130 use-case scenarios, SBs are experiencing AI's transformative advantages without in-house data scientists.

SBs in the United States are rapidly adopting AI tools to help them with their business needs. Impact on labor and retraining the workforce: We must recognize the transformative impact of AI on the labor market. Our research found that 48 percent of SBs anticipate cost savings by reducing their workforce with the help of AI tools. Among SBs already using AI tools, 71 percent expect a reduction in some jobs and the emergence of new ones. This represents close to three million individuals that will need reskilling. Proactive workforce development strategies are critical for the sustainability of small and medium-sized enterprises and the economy's overall health. It is a bottom-up adoption model:

Interestingly, 60 percent of AI solutions are introduced to organizations by team members seeking to enhance their job performance rather than by IT or management.

While this bottom-up approach can foster innovation and growth, it also presents security, privacy, and compliance risks as employees grant AI access to sensitive customer and business data.

Focus on business value: Our study highlights that SBs articulate the value of AI in tangible business outcomes, such as bolstering customer service, aiding retention, reducing expenditures, increasing profits, and automating marketing efforts.



SBs believe AI will help them achieve their business goals: SBs recognize the potential benefits of AI tools in their operations, with 67 percent of AI-adopting companies believing that these tools can help them achieve their goals. This finding underscores the importance of firsthand experience in shaping SB's perceptions and confidence

in AIs potential to drive success. Focus Areas in 2023-2024: On a forward-looking basis, SBs indicated that AI-driven automation of marketing, lead generation, customer service, and retention are the top priorities, while financial forecasting and revenue growth highlight the growing importance of AI in strategic decision-making processes. Customized AI Solutions for SBs Success:

Given the needs of SBs are diverse, it is crucial to provide customized solutions that address their specific requirements and industry jargon rather than generic, broad-based options. For instance, SBs are more inclined to adopt AI tools that streamline communication with dental patients, retail customers, or restaurant guests rather than using generic chatbots that cater to a wide range of industries.

How SBs learn about AI solutions: The most prevalent method for SBs to discover AI tools is through online searches and marketplaces, accounting for 41% of information sourcing. Personal recommendations from colleagues, team members, or friends also play a substantial role, contributing to 30 percent of SB's AI discovery process. Given this is often the driving force behind the adoption of AI, it's critical for vendors to establish a strong online presence in social media channels, col-

laborate with influencers, and cultivate positive word-of-mouth marketing by providing excellent product experiences and easy-to-try solutions.

Key factors: Over 50 percent of SBs identified the lack of skills in effectively using AI as the primary barrier to adoption. Among the key drivers influencing AI tool adoption are pricing, ease of use (to overcome the lack of skills), and online reviews or recommendations from peers and friends.

When searching for new AI tools, 41 percent of SBs prefer add-ons to their existing software, such as video conferencing, accounting, customer relationship management (CRM), human-resource (HR) systems, e-commerce, or productivity. 23 percent opt for single-purpose solutions that address specific pain points or operational needs. Business Models: The most prevalent business models for AI include subscription-based and usage-based pricing. An emerging trend in usage-based models involves charging for the business value delivered rather than merely counting executed tasks—further aligning the cost structure with tangible outcomes. Pricing is a critical barrier to AI tool adoption.

Freemium models play a significant role in overcoming this hurdle, particularly in the 60 percent of cases where

employees introduce AI solutions to their organizations.

Ethical, Privacy, and Security Risks and Concerns Introducing AI tools into a business can also create privacy and compliance issues. 52 percent of SBs seek guidance, frameworks, and tools to help them strike the right balance between harnessing the business value of AI and remaining compliant and secure.



Data privacy is a primary concern. As SBs gather and utilize more data with their AI Tools, there is an inherent risk of breaches and misuse of sensitive information. Compliance with data privacy regulations and adopting appropriate security measures are essential to safeguarding customer data. In addition, SBs should be transparent about how they collect and use customer data and obtain their consent before doing so.

This can help build customer trust and demonstrate a commitment to protecting their privacy.

Additionally, the lack of transparency and perpetuation of bias in AI algorithms is a growing ethical concern. To mitigate potential problems, SBs can engage a reputable value-added AI reseller or a consultant to audit tools, processes, and integration with sensitive data used by the business.

AI-Assisted marketing for art school increased lead generation, while saving money. The Organization A small, art education business offers classes and workshops and connects young people to enriching artistic experiences. With an annual budget of \$2M, the 10-member team has ambitious goals to double their income, elevate their social media presence to engage with potential clients and sponsors, and inspire their team and the community.

The Challenge

The team used an AI-powered marketing content generation tool to meet their objectives. The software generated personalized social media posts, recommended high-performing hashtags, pinpointed optimal posting times, and tailored the tone for a diverse target audience.



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The Georgia AI Manufacturing (GA-AIM) coalition, led by the Georgia Tech Research Corporation, will receive approximately \$65 million to accelerate the adoption of artificial intelligence across the state's legacy industrial sectors. The coalition recognizes artificial intelligence (AI) will soon be a ubiquitous feature of any successful manufacturer.

The GA-AIM coalition will establish the United States as a leader in AI manufacturing while ensuring these systems complement rather than replace existing workers. Coalition members across the state – such as the Technical College System of Georgia, Spelman College, and the Georgia Minority Business Development Agency – will execute projects to expand awareness, training, and job opportunities to underserved communities and businesses.

Fall 2023 TAG-Ed events:

You will want to take note of and browse the challenging and informative events planned for this fall.

Data Science for Business Professionals

– September 20, 8:00-10:00 AM

[Learn More](#)

Generative AI for Business Leaders

October 11, 8:00-11:00 AM

[Learn More](#)

Artificial Intelligence for Business Professionals

– November 8, 8:00-10:00 AM

[Learn More](#)

Data Science for Business Professionals

– December 6, 8:00-10:00 AM

[Learn More](#)



A Georgia Public-Private Partnership is Changing the Way we Look at Early-Career Workforce Development

Georgia is home to a wide array of companies ranging from startups to the Fortune 500, all reliant on a rich pipeline of talent to spur innovation and economic growth. However, there is often a gap between education and practical work experience impeding young professionals' access to these opportunities. What's more, the traditional internship and apprentice models fail to address the economic realities of most early-career professionals.

The Partnership for Inclusive Innovation (Partnership) launched its Fellowship program in late 2022 to address these challenges, while simultaneously building public-private cooperative affiliations in key growth areas for social impact. The Fellowship is a year-long paid experience, in which Fellows work with two employers within the same field — six months in the private sector and another six months in the public sector. In addition to gaining valuable experience and transferable skills, participants also benefit from mentorship, innovative collaboration opportunities, resume-building workshops and more.

Thus far, the Fellowship has directly served more than 240 individuals from five states, two countries, two continents and 11 universities.

Clarence Anthony Jr., the Partnership's workforce development program manager, discussed the program's diversity, stating, "the Fellowship program has proven to be a catalyst in cultivating a diverse group of early career professionals, with 90% identifying as racial minorities, 60% as women and 60% as first-generation college graduates."

Each class of Fellows receives a Greco-Roman name in a similar fashion to NASA missions. Athena, the newest cohort, succeeds to the first class of Fellows — Alpha. This is a powerful symbol to showcase the significance of launching the new workforce development pillar and its impact on our community and region at large.

Billyde Brown, senior research faculty member at the Georgia Manufacturing Institute, adds, "The Partnership's Fellowship is a groundbreaking oppor-



tunity for young talent who are underrepresented in their career fields to obtain valuable work experience and training to enter the workforce in both public and private sectors”.

Iesha Baldwin, a current participant in Alpha (Class 1), reflects on her experience thus far: “The Partnership’s Fellowship program has provided me with the skills and experience I needed to bring my career to new heights. More importantly, my peers and I have a deep sense of accomplishment by witnessing first-hand the result of our combined contribution on the recipient communities and industries we served.”

To showcase the meaningful impact of the Fellowship program and spotlight

the new class of Fellows dedicated to shaping the future of innovation across Georgia and beyond, the Partnership hosted its Workforce Development Roundtable on July 13 at The University Financing Foundation (TUFF) in the presence of Fellows, employers and ecosystem partners in workforce development, technology and innovation.

On this occasion, attendees had the opportunity to meet Alpha (Class 1) Fellows, hear from Athena (Class 2) Fellows, as well as meet and connect with the Partnership’s leadership team and a wide array of industry experts.

New Athena Fellows includes Rebecca Bryant and Savione Wright both of whom will both be working for Cox Enterprises in cleantech and IT &



Cybersecurity, respectively. Resheda Kelly will focus her work on digital equity for Microsoft. Kennedy Kishumbua and Taelor Malcom will work on AI manufacturing for NexTraq and the Socially Aware Mobility Lab, respectively.

Hearing from experts including the TUFF President and CEO Kevin Byrne, Georgia House Rep. Marvin Lim and Metro Atlanta Chamber Director of Talent Partnership Justin Haight, it became apparent how difficult it is to develop workforce development initiatives that truly serve the needs of its recipient community. Many stakeholders from the public, private or nonprofit sectors alike have tried and failed. Why? First, these initiatives tend to focus on short-term job placements instead of long-term, well-paying career opportunities. Second, these initiatives rarely take into consideration the realities on the ground or simply obtain buy-in and input from local population communities.

The collective effort led by the Partnership is unique and is paving the way nationwide on promoting the next generation of innovators. In fact, the Partnership represents an innovative new way to look at public-private partnerships altogether, focusing on long-term value instead of short-term outcomes. The Partnership was created to lead coordinated, statewide efforts aimed at positioning Georgia at the forefront of innovation and shared economic prosperity over time. The spirit of this joint effort is not new to Georgia, where leaders from the state's private sector, universities and nonprofits have a long-time history of coming together to collaborate with local government on issues of critical importance. Building upon this example, the Partnership is extending its reach to all corners of Georgia in a concerted fashion, to ensure that no potential innovator is left behind due to their location.

To learn more about the Partnership and its Fellowship program, visit: pin-georgia.org.

Content Invitation

Georgia Pathways™ STEM Magazine requests the privilege of including your content or the content of your students in upcoming issues. This is a great opportunity for students to be published and for educators and industry professionals to share their insights and wisdom regarding careers across Georgia.

If you have questions, please contact the publisher at:

wayne@tagonline.org

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Content submissions:

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Big Science Reaches Young Minds

By Sumner S Brown Gibbs / ORNL

A group at the Department of Energy's Oak Ridge National Laboratory made a difference for local youth through hands-on projects that connected neutron science and engineering intuitively.

Two members of ORNL's Women in Neutron Sciences, or WiNS, designed the projects as part of the group's outreach mission promoting equitable and inclusive access to education for science, technology, engineering and math, or STEM.

This spring, Dana Humphreys, lead control systems engineer for ORNL's planned third neutron source, the Second Target Station, spent two days with students from Midway Middle School, a STEM-accredited school in Roane County. The STS will complement the capabilities of the First Target Station and help advance research in areas such as clean energy and energy efficiency. Cristina Boone, a lead engineer

for the Second Target Station project, spent a Saturday afternoon with kids from YO-STEM, a non-profit launched by ORNL's Candice Halbert. The non-profit brings STEM education to underserved youth in East Tennessee.

Humphreys partnered with Midway Middle to facilitate an activity that compares aquarium maintenance to operations at the Spallation Neutron Source, or SNS. With help from ORNL, Humphreys provided 30-gallon fish tanks to Midway's sixth, seventh and eighth grades, which each class set up and maintained throughout the spring semester. Humphreys expressed her enthusiasm for partnering with a rural school similar to the one she attended as a child.

"Grit is at least as powerful as natural-born talent. People with grit don't give up," Humphreys said. "You don't have to be a straight-A student or come

from a privileged background to have a career in a STEM field. If you come from low socioeconomic status, but you are determined, there are many opportunities out there.

“My goals were to engage the students with the incredible science we do here and show them that everyone has a role. The scientists typically get the spotlight, but the science wouldn’t happen without many others working behind the scenes alongside them. It takes all of us — engineers, electricians,

mechanics and business and administrative personnel — to make it all work.”

Knudson taught each class about how control loops in the aquarium, such as water level, relate to control loops in the beamlines. In ORNL’s superconducting accelerator, giant magnets create magnetic fields that guide particles down the beamline at almost the speed of light. These magnets must be kept near absolute zero. Keeping the magnets cooled to this extreme means

Classroom aquarium that students established as part of an activity that intuitively teaches the youth about day-to-day operations at ORNL’s Spallation Neutron Source. Credit: Kevin Clinton/Midway Middle School





Students work on assembling their own robots in a lab setting, learning about gears and circuitry as part of an outreach activity with ORNL through YO-STEM, a local nonprofit that brings STEM education to underserved youth. Credit: Cristina Boone/ORNL

maintaining a certain cryogen level, or refrigerant, in the superconductors — like water level in an aquarium.

Students then chose an aquarium control loop (air flow, temperature or water level) to compare with SNS operations and later present to Humphreys, classmates and teachers.

“I think the real power of this outreach was having something tangible they could experiment with in their classroom and then relate it to the science we do here,” Knudson said. “It removed a typical barrier that arises when we try to explain the science and

it goes over their heads. This was not the case at Midway.”

WiNS member Cristina Boone partnered with YO-STEM one Saturday this summer to deliver a workshop to a group of kids, ages 5-13, about how gears and electrical circuits work in mini robots. She also brought two lab colleagues and her husband to assist with the activity and talk about their work. Boone and her partner spent weeks before the event printing 3D parts and soldering wires for each pocket-sized robot in their fleet. During the activity, students assembled

and tested their own devices.

Boone's passion for STEM education centers on outreach in marginalized communities. She remembers when her family moved from Mexico to Chicago.

"I am seeking to reach the communities that don't have a lot of exposure to technical and scientific fields," Boone said. "I grew up in Mexico and went to inner-city schools in the U.S. where I learned firsthand about the lack of resources. Teachers would do everything in their power just to get the kids through the school year. They did not have the resources they needed to prepare them for post-secondary education.

"There are so many young minds we can reach right here in our own backyard. And seeing the kids' faces light up when they learn they can make something work is its own reward."

SNS is a DOE Office of Science user facility. UT-Battelle manages ORNL for DOE's Office of Science, the single largest supporter of basic research in the physical sciences in the United States. The Office of Science is working to address some of the most pressing challenges of our time. For more information, please visit energy.gov/science



ORNL engineer Cristina Boone, left, organized a hands-on engineering activity for YO-STEM youth. One of Boone's passions outside of work centers on STEM education in local communities.
Credit: Cristina Boone/ORNL



Sumner Brown Gibbs / ORNL

Ocean Exploration Trust Enjoying 2023 Expedition Season

Exploring the Central and Eastern Pacific, Testing New Technology, and Expanding Partnerships

The Ocean Exploration Trust is enjoying the 2023 expedition season aboard Exploration Vessel (E/V) Nautilus.

You are invited to join us during ten separate expeditions over the course of eight months at sea that, along with our expedition partners, will map and explore deep-sea habitats in the Central and Eastern Pacific, as well as integrate several emerging technologies into at-sea operations.

From Hawaii and the US Pacific Remote Islands up to British Columbia and back, E/V Nautilus will cover thousands of miles of open ocean. The 2023 Nautilus expeditions are sponsored by NOAA Ocean Exploration via the Ocean Exploration Cooperative Institute, with additional support from Ocean Networks Canada, Office of Naval Research, Bureau of Ocean Energy Management, and Defense POW/MIA Accounting Agency.

“We are excited to build on our long-

standing partnerships and new collaborations for the 2023 Nautilus expedition as we continue to visit incredible sites of geological, biological, and cultural significance across the Pacific,” says Allison Fundis, OET COO. “Our collaborators and partners are essential to our program as we work to operationalize new technologies that advance the field of ocean exploration, bring the deep sea to classrooms and homes around the globe, and most importantly as we work to conduct ocean exploration expeditions in more ethical and equitable ways.”

OET’s expertise in conducting telepresence-enabled expeditions offers opportunities for scientists, students, educators, and the public to participate remotely from shore. Scientists on shore can connect with personnel aboard E/V Nautilus via high-speed satellite-connected streaming and thereby help plan and execute science operations on the ship. Nautilus’s 2023

expeditions will focus on exploring the geological history of seamounts in the Pacific, deep-sea coral and sponge gardens, and marine protected areas, as well as integrating cutting-edge technologies into at-sea operations.

The 2023 E/V Nautilus expeditions are primarily supported by NOAA Ocean Exploration via the Ocean Exploration Cooperative Institute, a consortium that brings together the scientific expertise and ocean exploration technologies from the Ocean Exploration Trust, University of Rhode Island, Woods Hole Oceanographic Institution, University of New Hampshire, and the University of Southern Miss-

issippi.

By combining resources and expertise, the Ocean Exploration Cooperative Institute seeks to accelerate exploration of the approximately 3 billion acres of submerged US territory in support of NOAA mission goals and the US National Strategy on Ocean Mapping, Exploration, and Characterization (NOMECE). Expeditions will also support the Biden-Harris administration's executive order on tackling the climate crisis (30x30), the GEBCO-Nippon Foundation's Seabed2030 Program, and the United Nations' Decade for Ocean Science for Sustainable Development.



“Most of our global ocean remains unmapped and unexplored, leaving significant knowledge gaps and hindering efforts to effectively manage our ocean resources,” says OET Chief Scientist Daniel Wagner. “Our expeditions will focus on collecting critical baseline information in unexplored areas, and thereby addressing the needs of the resource management and scientific community.”

From May to December 2023, E/V Nautilus expeditions have been made available to the public in real-time through live-streamed video on [NautilusLive.org](https://nautiluslive.org), a 24-hour portal bringing expeditions from the field to people on shore via telepresence technology. Viewers will be able to ask our at-sea team questions via the website and can also follow expeditions with behind-the-scenes updates on social media.

The team of STEM professionals will also connect directly to classrooms via free educational Q&A interactions from the onboard broadcast studio. An ongoing series of live events on social media will also highlight expedition overviews and STEM career features. Additionally, OET offers 100+ free STEAM education resources for K-12 learners in English and Spanish, including national-standard aligned activities, engineering design challenges, and creative projects for learners in the

classroom or at home.

As E/V Nautilus works in the Pacific, we acknowledge the indigenous and local communities of Oceania — including those known as Polynesians, Melanesians, Micronesians, Papuans, and other Pasifika peoples — who have stewarded through generations the ocean, seas, coastlines, and lands of what is known as the Pacific Ocean. We honor and respect the enduring deep relations and interconnections that exist between these peoples, the ocean, and the environment.

Ocean Exploration Trust is committed to building connections with local communities in expedition regions through co-developing expedition plans, making data publicly accessible, and coordinating outreach with schools and community groups, and welcomes collaborative partnership inquiries at info@oet.org.

Expeditions are planned and executed around priorities of the science and resource management community to close knowledge gaps. Mapping and ROV operations will primarily be conducted in unexplored areas, thus contributing directly to the US National Strategy for Ocean Mapping, Exploration, and Characterization, Seabed 2030, and the UN Decade of Ocean Science for Sustainable Development.



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NA151 CABLED OBSERVATORY MAINTENANCE



PACIFIC MAPPING
NA150/152 MULTIBEAM EXPLORATION

PAPAHĀNAUMOKUĀKEA MARINE NATIONAL MONUMENT
NA154 ROV EXPLORATION & MAPPING



HAWAIIAN ISLANDS
NA155 OECI MULTI-VEHICLE EXPLORATION
NA156 ROV EXPLORATION
NA157 MULTIBEAM EXPLORATION

PACIFIC REMOTE ISLANDS MARINE NATIONAL MONUMENT
NA149 ROV EXPLORATION NEAR KINGMAN & PALMYRA ATOLL
NA153 ROV EXPLORATION & MAPPING NEAR JOHNSTON ATOLL
NA158 MAPPING EXPLORATION NEAR JARVIS ISLAND



Integrating several autonomous vehicles onto E/V Nautilus will help advance national and international priorities for multi-vehicle ocean exploration.

The Ocean Exploration Trust OET was founded in 2008 by Dr. Robert Ballard to explore the ocean, seeking out new discoveries in the fields of geology, biology, maritime history, and archaeology to engage in pure ocean exploration.

International programs center on the scientific exploration of the seafloor, innovating new ways and technologies to conduct exploration, and engaging and educating the next generation on the significance of science, technology, engineering, art, and mathematics (STEAM) through the excitement of discovery.

Expeditions are launched from aboard Nautilus — a 68-meter research vessel — and with collaborative technology partners. During expeditions, we offer onshore explorers live video, audio, and data feeds from the field in addition to ship-to-shore interactions with classrooms and learning venues for students. We bring educators and students of all ages aboard during deep-sea exploration, offering them hands-on experience in ocean exploration, research, and communications. OET is committed to working towards creating more diverse and inclusive programs — both at sea and on shore — to ensure our exploration and education programs include, amplify, and make space for more historically marginalized voices in the deep-sea exploration and STEAM communities.

[Ala Aumoana Kai Uli in Papahānaumokuākea Marine National Monument](#) **Sept 1 - 28, 2023**

We once again voyage to the Papahānaumokuākea Marine National Monument (PMNM) to explore unseen deep-sea habitats using our ROV technology. Further exploration in these areas is urgently needed to address the management and science needs of the region, including a better understanding of the deep-water natural and cultural resources of PMNM, biogeographic patterns of species distributions, and the geological context of the region. This 27-day expedition started and ends in Honolulu and utilize the ROV and mapping capabilities of E/V Nautilus to survey previously unexplored deep-sea (>200 meters) habitats of PMNM, focusing on areas towards the northwestern extent of the Monument.

[OECI Multi-Vehicle Exploration](#) **October 1 - 19, 2023**

Over the last three years, the Ocean Exploration Cooperative Institute has been testing the integration of multiple exploration technologies via annual technology demonstration expeditions aboard E/V Nautilus. This third iteration of technology demonstrations will transition these systems from prototypes and demonstrations to operational tools for ocean exploration.

This 18-day telepresence-enabled expedition will include deployments of USV DriX, AUV Mesobot, and Deep Autonomous Profiler, each of which offers complementary capabilities to explore the ocean from the deep seafloor through the entire water column. The expedition will start and end in Honolulu and explore the seafloor and overlaying water column around the Geologists Seamount chain located south of the Main Hawaiian Islands.

[Ocean Exploration Through Advanced Imaging](#) **October 22 - November 5, 2023**

In October, we return to ROV dives continuing our work to advance technology use in the deep sea. Experimenting with deploying a new camera technology, we will explore using a new wide-field camera array on ROV Hercules to capture three-dimensional stereoscopic imagery from the seabed. One of the modern challenges of ocean exploration is processing and reviewing the high volume of data generated from each expedition. On this voyage, we will also test a Rapid Automatic Image Categorization artificial intelligence software to quickly annotate video in near real-time.

[Hawaii Mapping](#) | **November 7 - 17, 2023**

This 10-day expedition will start and

end in Honolulu and utilize the deep-water mapping capabilities of E/V Nautilus to survey previously unmapped seafloor in the US EEZ south of the Main Hawaiian Islands. In addition to deep-sea mapping operations, the expedition will also include deployments of the Deep Autonomous Profiler to collect visual, environmental, and eDNA data to enable baseline characterizations of the deep-water environments of this region. This expedition will also include opportunities for student interns to obtain at-sea training, including mapping and other marine science operations.

[Jarvis Island Mapping](#) | November 20 - December 20, 2023

The seafloor surrounding Jarvis Island includes some of the most poorly

mapped areas under US jurisdiction.

Mapping these areas is urgently needed to support management and science priorities of the Pacific Remote Islands Marine National Monument (PRIMNM), including follow-on surveys to better understand the natural and cultural resources of the Monument. This 30-day expedition will start in Honolulu and utilize the deep-water mapping capabilities of E/V Nautilus to survey previously unmapped seafloor in the Jarvis Unit of PRIMNM. In addition to deep-sea mapping operations, the expedition will also include the participation of several student interns, who will obtain at-sea training in mapping operations.

<https://nautiluslive.org/>





The STEM : Pioneering a Paradigm Shift for Women in Oral Health

By Elizabeth Alex

*W*hat would bring six highly esteemed women, educated and serving at some of the finest universities in the world to a small city in Southwest Missouri near the borders of Kansas, Oklahoma and Arkansas?

The dream of turning an area with a dearth of dentists into an oasis of good oral health. Based on the principles of kindness, empathy and compassion, several women have built the Kansas City University (KCU) College of Dental Medicine from the ground up to improve oral health care for a region in desperate need while offering opportunities to a diverse group of students with an interest dental medicine, community service and research.

When Dr. Linda Niessen graduated from Harvard School of Dental Medicine in 1977, women were less than 5% of dentists and not well represented in the sciences. “When I started in dentistry, it was predominately a male field. Patients were a little worried about seeing a woman dentist,” she said. “Women are now fifty percent of the dental school classes and about thirty percent of dentists in practice.”

As the founding dean at KCU, Niessen recruited a team of qualified women to build the College of Dental Medicine. “Positions within dental education in large part are still held by men,” Niessen noted. “Historically, women haven’t served as professors or deans or in other leadership roles.” Niessen and her team hope to improve those numbers.

Among the women who answered Niessen’s call were two of her former students. Drs. Erinne Kennedy and Katie Champion who were the first recruits. Kennedy, now serving as



assistant dean for curriculum and integrated learning, designed the school's innovative curriculum, an integrated educational model linking biomedical, behavioral, and clinical sciences. Niessen tabbed Champion to serve as director of clinical operations after having worked in private practice in Florida for three years.

As the inaugural director of clinical operations for KCU's Oral Health Center, Champion contributed to the building design, the development of clinical curriculum, and the supplies and equipment needed for the clinical curriculum.

Niessen continued assembling her founding team with the hiring of Sharon Gordon, DDS, and Diane Ede-Nichols, DMD. Named associate dean for academic affairs and research, Gordon earned a PhD in epidemiology from Johns Hopkins University. Dr. Gordon previously held academic leadership positions at the National Institute of Dental and Craniofacial Research and the National Institutes of Health and helped start Eastern Carolina School of Dentistry in North Carolina. In 2022, she served as a coauthor the Surgeon General's Report Oral Health in American: Advances and Challenges.

Ede-Nichols joined KCU as associate dean for clinical education and patient care. After earning her dental degree from Fairleigh Dickinson University, she earned a Master's in Health Law and Master of Public Health at NSU's Shepard Broad College of Law and College of Osteopathic Medicine, respectively.

"There are no dental schools in Arkansas or Kansas"

The women are diverse in age and backgrounds, but share a passion for service and a desire to encourage other women. "Today's women dental students will find themselves well represented in the class' composition," said Gordon. This will lead to development of a support group so helpful to success in dental school."

Gordon, who has distinguished herself in the area of research, says women are making great strides in the field of dental medicine. She believes the narrowing gender gap in health sciences will eventually be replicated in other areas of STEM. "The gender gap in technology fields such as engineering, computer science and physics remains," Gordon said. "As more women enter scientific careers, I predict women will eventually become equally represented leading to changes in career and leadership opportunities for women, and led by women."

Upon its opening, KCU's College of Dental Medicine became the 70th dental school in the United States. KCU's College of Dental Medicine will address the significant and growing oral health needs of the four-state region that includes Missouri, Arkansas, Kansas and Oklahoma.

There are no dental schools in Arkansas or Kansas, and the nearest dental schools in Oklahoma and Missouri are located outside of a 100-mile radius of Joplin, in which the majority of counties are designated as Dental Health Professional Shortage Areas according to the US Health Resources and Services Administration.

The college welcomed its first class of 80 students July 31. Among those 80, 45 percent are from the four-state area. Nearly 60 percent of the students are from rural communities and aspire to establish practices and serve rural communities when they graduate. 25% of the class are the first in the family to graduate college.

Latasha Vick MHS, DDS, director of community-based education and outreach, was a physician's assistant before she went to dental school. She is well aware of the obstacles women face



in science, yet she says all of them can be overcome. “Navigating obstacles is not new for women,” Vick said. “Women in science can be met with gender bias and sexism. Women who are intentional in pursuing science related fields have an opportunity to serve as role models for upcoming generations. In dentistry, women have the opportunity to add value and perspective by providing education, preventive measures and helping patients manage oral health related concerns.”

The esteemed team of women and their equally-qualified male colleagues have built a dental school that will teach new dentists to serve and care for their patients with kindness at the core of their practices. “Students will learn by our example, said Niessen. “Humanism

is a vital component of our curriculum.” Not only are they shifting the paradigm of leadership in dental education, they will bring new ideas to dental curriculum, an interactive approach emphasizing learning by doing, practicing, testing and even the opportunity to fail using virtual reality simulators.



In addition to state-of-the-art educational labs, the CDM will house an Oral Health Center where students will experience hands-on learning by providing dental services to patients under the supervision of dental faculty. CDM faculty will soon begin offering care to patients who lack access to oral health care. “Students will be treating patients in their second year of study,” said Niessen. “Faculty members share a strong desire to serve our community right away and will soon see individuals who have had difficulty obtaining needed dental care through referrals with local nonprofit agencies.”

The women who created the nation’s newest College of Dental Medicine believe they have the best jobs in the country. They will provide education that gives dental students the opportunity to practice dental medicine, and do it in a health profession that offers increasing opportunities for leadership and career advancement.

“If a woman is interested in attending dental school,” mused Vick, “my advice would be, GO FOR IT!”

About the author -

Elizabeth Alex is the senior director of public relations and community outreach at Kansas City University (KCU). In her role at KCU, Elizabeth helps tell the story of the University, its programs, students, faculty and research on the KCU campuses in Kansas City and in Joplin. Additionally, Elizabeth serves as co-chair of the KCU Community Outreach Task Force.

Prior to her work in public relations and community outreach, Elizabeth enjoyed a long career in television news. She was an anchor and reporter at KSHB-TV in Kansas City, earning many journalism awards for health and investigative reporting that included five Regional Emmys. Elizabeth graduated from the University of Arkansas with a degree in Broadcast Journalism.



Dental Simulator





Young Innovators from 78 Countries Develop New Solutions to World's Water Challenges

More Than 1,000 Students Compete in Xylem Global Student Innovation Challenge.
Grand Prize Winners Hail from Portugal, India, Hong Kong, and Pakistan

By Houston Spencer / Xylem

Students from 78 countries have proposed fresh ideas to address the world's intensifying water challenges with entries in the 2023 Global Student Innovation Challenge hosted by water technology leader Xylem (NYSE: XYL). More than 1,000 students created new solutions for a range of pressing water issues, including green hydrogen production and reducing plastic pollution. Now in its third year, the challenge

invites the next generation of water innovators to solve critical water issues and empowers them to become leading contributors to serious environmental challenges. This year, students were challenged to analyze the water impact of green hydrogen; move from awareness to action on water issues; prevent waterway pollution using data science; and consider the water-energy-emissions nexus in buildings.



“The water issues of today and tomorrow won’t be solved by simply doing things the same way they’ve always been done. Solving today’s greatest water challenges demands innovative ideas and fresh approaches,” Patrick Decker, President and CEO of Xylem, said. “Engaging this new generation of water leaders and connecting them with a bigger platform to make global impact is critical. We’re energized by the insight, ingenuity, and ambition so many students have brought to this challenge.”

The winning teams shared a \$20,000 prize pool and a place in Xylem’s Ignite Innovation Incubator, a program that supports participants in scaling solutions. Xylem recognized the winning teams at a virtual ceremony held last June.

Team WASTE2H from Porto, Portugal, is this year’s grand prize winner in the secondary (high) school category, recognized for their work in analyzing and reducing the water impact of green hydrogen production. “Producing green hydrogen can be very water intensive,” the team said. “Our solution brings together green with green. It combines the sustainable energy used to generate green hydrogen with a production method that uses marine purple photosynthetic bacteria which can be grown using wastewater.”

The team’s proposed solution of using wastewater could reduce the intensity of clean water required to produce hydrogen.

The Ocean Rescuers Team from India, Hong Kong, and Pakistan is the 2023 grand prize winner in the tertiary (university) category, for its approach to identifying, mapping, and proposing a solution for a waterway impacted by plastic pollution.

“Our project developed a detailed scoring system to identify and rank high-risk plastic pollution sites in India,” noted the team. “But our approach has universal relevance. It can be applied to other regions to identify pollution hot spots and develop effective, targeted solutions.”

The Global Student Innovation Challenge is part of Xylem Ignite, a youth program designed to inspire and empower the next generation of water leaders to drive real changes in the water industry. Increasing youth engagement in solving global water challenges is a key part of Xylem’s Sustainability Goals and in 2022, more than 11,000 students participated in Xylem Ignite events including the Global Student Innovation Challenge, hackathons, and the Ignite Innovation Incubator.

Watch the virtual ceremony -
<http://www.xylem.com/ignite>

Blue Ridge

Rome

Atlanta

Athens

STEM is Georgia Wide

Columbus

Macon

Savannah

Albany

Brunswick

Valdosta