Leading the Future for Students, for Educators, and in Technology

Transforming education today to build the workforce of tomorrow

AT&T

CENTER FOR DIGITAL EDUCATION



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AT&T's Mission in Education

AT&T invests in education and job training to create a skilled and diverse workforce that powers our company — and our country — for the future.



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Today, nearly every job is touched by some form of technology. If it's not, it will be soon. Technology has changed the way employees communicate, collaborate and connect. It has changed not only how we work, but where we work. The jobs of today and tomorrow demand a tech-savvy, robust and diverse talent pipeline.

Unfortunately, the need is outpacing the supply. Nearly 40 percent of American employers say they cannot find people with the skills they need. Almost 60 percent complain job seekers are not prepared to tackle even entry-level jobs.[1] All told, over six million jobs are unfilled in the U.S. today.[2]

This gap means education must evolve. But preparing students and reskilling current workers for the jobs of the future is not solely the responsibility of schools, colleges and universities. It must be a community effort, and industry must play a substantial role. Improving education and developing the 21st-century workforce will require corporations to collaborate with educators and community organizations to grow programs that work. That's why AT&T is committed to helping students succeed in school and develop the skills they need to thrive in their careers and their lives.

Technology is a significant part of the equation.

"Technology is making it easier for everybody — regardless of age, gender, geography or income — to learn anytime, anywhere," says Charlene Lake, senior vice president for Corporate Social Responsibility, AT&T. "Innovations in technology remove physical barriers associated with learning. That's extraordinarily important to the future success of students and the workforce."

This guide presents five ways industry and education can — and are — collaborating to prepare students for the future workforce. In sharing this guide, we hope to inspire educators and businesses to look for creative ways to work together to help lead the future for students, for educators and in technology.

Did you know?

- Since 2008, AT&T has committed **$450 million** in programs to help millions of students in all 50 states and around the world.
- Over the past 5 years (2013-2017), AT&T invested nearly **$145 billion** in their networks, more than any public company in the United States.
- From mobilized learning to IP networking and security solutions, **hundreds of AT&T professionals** are serving schools and universities across the country.

Strategy 1:

Begin Workforce Development in K-12



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A few years ago, teacher Conor Corey was struggling to find curriculum for his fifth-grade math class in one of the poorest schools in Philadelphia. By chance, Corey discovered Khan Academy, an organization that provides free, online educational resources. Khan Academy filled Corey's immediate needs for math curriculum, and provided an alternative for students who were advancing faster than their peers.

In 2017, Corey moved to Willow Dale Elementary, a Title I school with approximately 1,200 students in a working-class district north of Philadelphia.

"The superintendent saw several things I was doing with open resources, including Kahn Academy, and he gave me the opportunity to come to Willow Dale and pilot it as an intervention for math classes throughout the school," says Corey.

The Khan Academy pilot was a success. Willow Dale raised standardized test scores by more than 20 percent, the only school in the district to do so. Based on those results, Corey wanted to explore how he could use Khan Academy to provide students additional curriculum and workforce development opportunities.

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Giving Promising EdTech Startups a Leg Up: The Aspire Accelerator Program

Aspire is AT&T's signature philanthropic initiative that prepares people for careers in technology, media and telecommunications, and helps more students graduate high school. The program was launched 10 years ago to provide access to education and training that enable people to acquire or keep good jobs.

In addition to working with various organizations to promote educational opportunities, AT&T also seeks to scale the best new educational technology ideas through Aspire Accelerator. The program, started in 2015, offers support and mentoring to innovative edtech startups.

"We started the Aspire Accelerator to empower early stage organizations developing education technologies," says Anne Wintroub, director, Social Innovation, AT&T. "These are ideas we see as having the greatest potential to positively affect students, teachers and parents across the globe."

Every year AT&T selects six to 10 companies to work with for six months. During those six months the selected companies get access to an array of AT&T resources. The program is highly competitive. In 2018, AT&T received nearly 400 applications and accepted just eight companies.

Diversity plays a significant role in the selection process.

"In addition to supporting the great educational companies of tomorrow, we are also empowering diversity in entrepreneurship across the country," says Wintroub. "We pledge that for each class at least half of the members will be people of color or women, and from areas of the country that are not tech hotbeds."

After six months, the companies are on their own, but remain part of the Aspire Accelerator community. So far, AT&T has accelerated a total of 27 companies.

This year's class comes from a diverse set of backgrounds — geographically, culturally, ethnically or professionally — and is committed to taking on an entirely new and unique set of challenges:

Caribu (Miami) allows any trusted adult to read and draw with children, through an interactive video call, no matter how far apart they are.

MindRight (501(c)3/Newark, New Jersey) empowers youth of color to heal from systemic oppression trauma — including structural violence, poverty, racism and discrimination — with support via text message.

Move This World (New York) uses multimedia content to develop social skills and strengthen emotional intelligence in Pre-K through high school.

Substantial (501(c)3/Oakland, California) creates training, resources and information that substitute teachers need to be successful. The program is customized for each school system's unique context and is delivered online with modern, mobile-friendly technology.

Unruly Studios (Boston) revolutionizes learning by combining STEM education with physical play. It teaches kids how to code and gets them active.

Weird Enough Productions (501(c)3/Lithonia, Georgia) teaches students how to combat fake news, identify media bias and create positive content through an edtech tool.

Words Liive (Washington, D.C.) makes it effortless for teachers to integrate music into lessons.

Zoobean (Arlington, Virginia) provides a web application, mobile app and prospective hardware device through which families can track their independent reading and stay motivated to read.







Photos courtesy of AT&T

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Workforce development has been viewed as a tool for people already in the workforce. But today, it can also help youth acquire knowledge and skills they'll need in the future. Research shows workforce development programs can help narrow the gap between labor shortages and the skills needed for highly skilled positions. Starting early and using technology in the process is key. Platforms like Khan Academy provide a robust library of online learning tools and curricula so students face fewer learning limitations.

"Kids born today will have jobs that don't even exist yet," says Corey. "Students will need to develop skills beyond basic literacy — skills that can help them compete in the global economy."

Rather than force highly motivated students to stick to standard curriculum, programs like Khan Academy help students learn new skills that can better prepare them for the workforce.

"To teach by competency instead of by grade levels is a game changer," says Corey. "We have kids in second and third grade creating their own video games based on what they learn with Khan Academy. We have fourth graders doing algebra. We have fifth graders learning physics. To have a resource available to students that's factual and mastery based is unbelievable. I think it's going to help students better prepare for the direction they want to go in their careers."

In 2017, AT&T contributed $2.25 million to Khan Academy to launch LearnStorm, a national learning challenge designed to equip students with the skills and mindsets they need to start the school year strong. LearnStorm combines Khan Academy's thousands of free, standards-aligned exercises with new, limited-time-only incentives to engage, celebrate and reward every student — no matter their level. The initiative reached nearly one million students, 23,000 teachers and 13,000 schools, and encouraged 90 million minutes of learning.

Hands-on programs are also highly effective workforce development tools. Last year, 15 Bronx High School students completed the first-ever summer internship program in AT&T retail stores in New York City. The program, dubbed DreamYard in the Bronx, allowed students to shadow AT&T sales and customer service experts at nine Bronx-area retail stores. Over the course of four weeks, the students learned about wireless technology and business management in a real-world setting.

"This was the first time in a work setting for all of them, and the impact was significant," says Marissa Shorenstein, president, east region external affairs, AT&T. "Just giving them an AT&T shirt to put on each day and heading off to work had such an impact on them — they understand the value of work and a job."

At the end of the summer, each student gave a presentation on the skills they gained throughout the program.

"The goal was to equip students with the professional skills and experience they need to succeed in college and beyond," says Shorenstein. "We hope the experiences will inspire these students to continue to pursue careers in technology — and maybe one day, back at AT&T."

Did you know?

- Since the program's launch in 2015, AT&T Aspire Accelerator participants included **63 percent women-led companies and 44 percent minority-led companies.**
- Unlike other accelerators, companies do not have to move to participate in the Aspire Accelerator. **All activities can be conducted online.**
- In addition to a **$100,000 investment and an additional $25,000 to cover costs** associated with the program, Aspire Accelerator companies receive access to a dedicated Entrepreneur in Residence, UI/UX design services and opportunities to participate in education conferences. For nonprofit participants, the "investment" is in the form of a charitable contribution.

Strategy 2:
Start a Mentoring Program



Did you know?

- Women remain underrepresented in the science and engineering workforce. While women receive more than half of bachelor's degrees awarded in the biological sciences, they receive far fewer in the **computer sciences (17.9%), engineering (19.3%) and mathematics (43.1%).**[3]
- For the past five years, AT&T and Girls Who Code have offered high school students more than **300 hours of instruction** in web development and design, robotics and mobile development, including mentorship and exposure to top female engineers and entrepreneurs.
- Beyond Girls Who Code, AT&T collaborates with other nonprofit education groups such as iCouldBe and Nepris to **connect students to mentors.** AT&T also recently kicked off a pilot with Career Village, a nonprofit educational technology organization that helps young people in low-income communities get personalized online college and career advice.

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As a freshman in high school, Anah Lewi knew very little about computer science. But while searching the internet, she discovered a video that caught her attention. "What Most Schools Don't Teach" featured tech pioneers and celebrities discussing the benefits of learning to read and write code.

"That video brought to life something I'd never thought about before," says Lewi. "So much of our lives are governed by technology today — it should be something students learn about. I decided after watching that video that I wanted to learn to code."

Lewi applied for and was accepted to the Girls Who Code Summer Immersion Program, which is supported by AT&T. Girls Who Code is a national initiative that exposes high school girls to computer science and jobs in technology. During the seven-week class, Lewi learned a variety of technical and business skills. But the curriculum was challenging, and Lewi sometimes felt frustrated.

Fortunately, mentoring is a large component of the Girls Who Code program.

"Computer science is challenging, and you are going to make mistakes. The mentors and teaching assistants were always there to help us and encourage us when we got frustrated," says Lewi.

Mentoring is proven to have a positive impact on students' efficacy, confidence and decision-making skills and to enhance their career aspirations.[4] For Lewi, mentoring encouraged her and kept her engaged.

"Mentoring is important not only for a young woman of color, but women in general because we are heavily underrepresented in the tech industry. It's important to have someone to look up to."

– Anah Lewi, Former Participant, Girls Who Code Program

"Mentoring is important not only for a young woman of color, but women in general because we are heavily underrepresented in the tech industry. It's important to have someone to look up to," says Lewi.

Interaction with Girls Who Code mentors also put Lewi on AOL's radar, with whom she interned during the summer before her senior year of high school.

Following high school graduation, Lewi enrolled at Wellesley College, where she's pursuing an undergraduate degree in computer science.

"Having that exposure before coming to college absolutely changed the way I looked at computer science," says Lewi. "And I now have a network of people I can turn to when I get frustrated and I know they'll encourage me and help keep me going."

How Mentoring Promotes Success: **AT&T Aspire**

The Aspire program has three parts: Connecting with organizations that are doing great work in education and scaling those organizations (for example, programs like Girls Who Code, Imagination Foundation, Media Maker and Code.Org); finding and promoting technological innovations that are solving real-world problems in the education community; and mentoring.

AT&T employees mentor students throughout the country to help them discover their career passions and potential. Since October 2012, AT&T employees have impacted more than 350,000 students through more than 2.2 million hours of mentoring.

According to Senior Vice President for Corporate Social Responsibility Lake, AT&T emphasizes online mentoring because it allows more students to receive — and more AT&T employees to offer — mentoring services.

"It's difficult for many professionals to mentor in the traditional way, which usually involves spending time with a student offsite," says Lake. "If we can provide mentoring opportunities via technology it makes it easier for everybody that wants to get involved to do so. Our employees are passionate about education, and they play a critical role in this program through their mentoring efforts."

Did you know?

- Studies show that students who participate in **online mentoring outperform their peers** both emotionally and academically.[5]



Strategy 3:

Expose Students to Workforce Technologies

> **“When students are immersed in technology in school, they are better prepared for a workplace that increasingly relies on technology. That’s a critical component of building the talent pipeline.”**
>
> – Karen Nash, Director, 21CAP



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When new students arrive at Howard University’s School of Business, they are enrolled in the 21st Century Advantage Program (21CAP). 21CAP is an innovative program that introduces students to college and business life through mentoring and a three-semester course designed to prepare them for business careers.

21CAP was launched in 1993. As the years progressed and technology became integral to business, 21CAP organizers sought ways to better connect students with the working world. The university turned to the business community for help.

In 2016, AT&T joined 21CAP, “adopting” a team of freshmen each year. The student teams conduct presentations and develop hypothetical AT&T products.

“Engaging collaborators like AT&T is extremely helpful in giving students exposure, knowledge and awareness of the skills and the tools they’ll need in the workplace,” says Karen Nash, director of 21CAP. “When students are immersed in technology in school, they are better prepared for a workplace that increasingly relies on technology. That’s a critical component of building the talent pipeline.”

The program also allows Howard’s School of Business to better pivot with the business world.

“The business world tends to move at a much quicker pace than education,” says Dr. Kanika Magee, assistant dean of student affairs for the School of Business. “This program allows us to better understand what businesses need and ensure the educational experience students get matches the evolving needs of business.”

Some students also join AT&T for internships.

“A lot of what we achieve in life is determined by what we see around us,” says Nash. “21CAP surrounds students with professionals from a variety of industries and many levels within those industries, so they are able to experience working for a technology organization in a hands-on way and envision where they want to go in their lives.”

In addition to Howard University, AT&T works with other organizations to provide internships designed to expose students to workforce technologies. For example, Genesys Works links high school students to internship opportunities at AT&T and several other corporations. Year Up, a national nonprofit that enables urban youth to move from poverty to professional careers, includes a six-month full-time professional internship at a corporation.

Degree or Nanodegree?

Building the workforce of the future means providing access to new types of educational opportunities.

“There are currently more than five million unengaged young adults — who are not working and not in school,” says Lake. “These young people represent tremendous untapped potential.”



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AT&T works with various organizations to connect students to opportunities through education and job training, often leading to degrees or certifications in specialized fields. These opportunities serve as a source of future talent and demonstrate how technology can make it easier for everyone to obtain specialized skills.

For example, in 2014, AT&T collaborated with Udacity to create a series of nano-degree credentials — bite-sized degrees students or adults finish in about six months focused on skills like front-end web design, back-end web design, data analysis, web development and programming.

“If students don’t feel like a four-year degree is the right path for them, this gives them a different pathway to a successful career in the tech field,” says Lake.

Today there are more than a dozen nanodegree credentials available, and more than 50,000 individuals have enrolled in various nanodegree credential programs.

Investing in Innovation

The explosion of data in recent years is unprecedented. Data traffic on the AT&T network alone has increased 250,000 percent in the last decade since 2007. Today, the AT&T advanced network carries more than 206 petabytes of traffic on an average business day. Few people beyond particle-colliding physicists see the amount of data that crosses the AT&T global network.

With the rapid proliferation of data, the cyber landscape is also changing. New technologies emerge at an exponential rate, user expectations shift rapidly and security threats perpetually multiply. The private, hardware-centric networks of yesterday can no longer keep up with the growing demands of today and tomorrow.

As education institutions deliver content online and drive smart, connected campuses, networks will need to keep up at an accelerated rate — in scale, accessibility and security. Keeping pace requires innovation, flexibility and constant investment. Between 2013 and 2017, AT&T invested nearly $145 billion in both wireless and wireline networks — more than any other public company.

The big bet network.

AT&T is on a mission to support education institutions in their move from hardware-centric to software-defined networks. Advanced networks, offered as-a-service, will enable schools to deliver content quickly and securely while allowing students access across the globe.

"In K-12, access to a fast, reliable network enables individualized learning, gives students access to rich, virtual educational experiences and enables the administration to more easily manage learning systems," says Michael Keenan, technical sales manager, AT&T. "In higher education, advanced networks can enable collaboration and allow students to connect to educational resources from anywhere."

No one can expect a network model designed years ago for modest and predictable increases in voice traffic to adapt to a world of streaming services, connected devices and photo-intensive social media. Many have tried to keep up with the increase by using more and more hardware but that's no longer feasible. It's too slow, too inefficient and too expensive.

AT&T found a better way. It's a model developed in the IT world, where software emulates the functions of complex pieces of hardware, and capacity can be quickly added to push out upgrades at the speed of the internet.

That's the model for AT&T's next-generation network, powered by technologies, like software-defined networking (SDN) and network function virtualization (NFV). SDN is an architectural framework that uses virtualization, automation and other technologies to deliver services anywhere in the network, regardless of the devices that the network connects to — and NFV replaces dedicated routers, firewalls and other hardware devices with software that runs on commercial servers.

When AT&T unveiled its SDN effort in 2014, many observers thought it was too aggressive. But, AT&T made the right bet. In early 2015, the company announced its goal to virtualize and software-control 75 percent of core network functions by 2020. Last year, AT&T reached 55 percent and plans to hit 65 percent by the end of 2018. AT&T also leverages artificial intelligence (AI), predictive modeling and other tools to analyze network performance and support shifts in traffic patterns and network demand. These tools enable AT&T to "identify potential congestion and route or re-route traffic instantaneously," says Bob Zapotocky, principal architect, AT&T.

"Transforming our network is about providing the flexible connectivity our customers want and need," says Sami Thibault, technical sales director, AT&T. "The world is changing at such a fast pace. Networks have to be agile so we can provide schools what they need to facilitate student success."

The risk is real.

For technology to be effective, the digital learning environment must be highly secure. School network breaches are on the rise, and they don't always involve cybercriminals. For example, earlier this year in San Antonio, a K-12 student launched a distributed denial of service (DDoS) attack on the school network, effectively shutting it down on the day of midterms.

"That's the new normal in K-12," says Trent Redden, applications sales manager, AT&T.

A DDoS attack occurs when a hacker takes control of several computers and aims them at a single server, overwhelming that network with traffic and ultimately knocking it offline. DDoS attacks can disrupt teaching, learning, communication and other day-to-day operations at schools, colleges and universities.

In higher education, cybercriminals looking to steal personal information or intellectual property are often the culprits. Threats often take the form of ransomware. Files are accessed and encrypted by the perpetrator who can then demand large ransom payments to release the data. This can leave establishments with a stark choice — pay or suffer the consequences.

"Higher education institutions traditionally aren't focused on protecting their networks because that's not their primary mission," says Patrick Robinson, application sales consultant, AT&T. "On top of that they often have limited budgets."

The explosion of data is unprecedented. An institution would need an army of 24-hour security guards looking at network logs, firewalls, routers, servers and more — and by the time all of that data is collected, it could be too late. Intelligence in the network, however, can identify random malicious attacks faster than any human can alone. And AT&T secures more connections than any communications company in North America and analyzes approximately 686 billion flows of network data that represent on the order of 19 petabytes of data per day. A single petabyte is like streaming an HD movie for 45 years.

"On average, we see 90 billion probes for potential vulnerabilities across our global IP network every day," says Redden. "If a new threat emerges, we can deploy a wide variety of resources to help protect our education customers.

A faster, smarter future.

To meet student expectations, education institutions need to provide ubiquitous, on-demand mobile network access. But the move toward connected campuses exponentially increases network traffic and bandwidth requirements, including new routing challenges. AT&T and the Institute for the Future (IFTF) recently released a report that explores the emerging technologies of 5G and edge computing with a view into the future of education technology.

The report discusses how high-speed mobile networks and AI at the network's edge will create a culture of learning that is not confined to the classroom. Continuous learning will be accessible through augmented reality (AR) and virtual reality (VR) experiences that are relevant to where people are at an exact moment. AI guides and ultra-high-definition video streaming will dramatically expand the concepts of distance learning.

Imagine if recess could become in-the-field research by superimposing a digital understanding of physics on playground equipment. Imagine high school students thousands of miles away controlling a robot inside an active volcano. Imagine graduate students across the world exploring the rain forest together and virtually discussing their findings. Each of these learning experiences will be social, connected, collaborative and immersive — driving deep engagement and elevating the human experience.

At the University of Oklahoma, AT&T and The Weather Channel collaborated to equip mobile research trucks — used by the university's Advanced Radar Research Center — with enhanced severe weather technology and Internet of Things (IoT) sensors. These enhanced trucks will soon have cameras capable of streaming live video and near real-time radar data during severe weather events. Storm data and video will provide meteorologists with better observations, analysis and forecasting capabilities. Live video and near real-time data also can improve prediction systems, shorten warning times, and potentially lessen loss of life and property.

"We're working very aggressively to maximize connectivity and access to academic content for students," says Chris Lusey, AT&T Public Sector - Oklahoma.

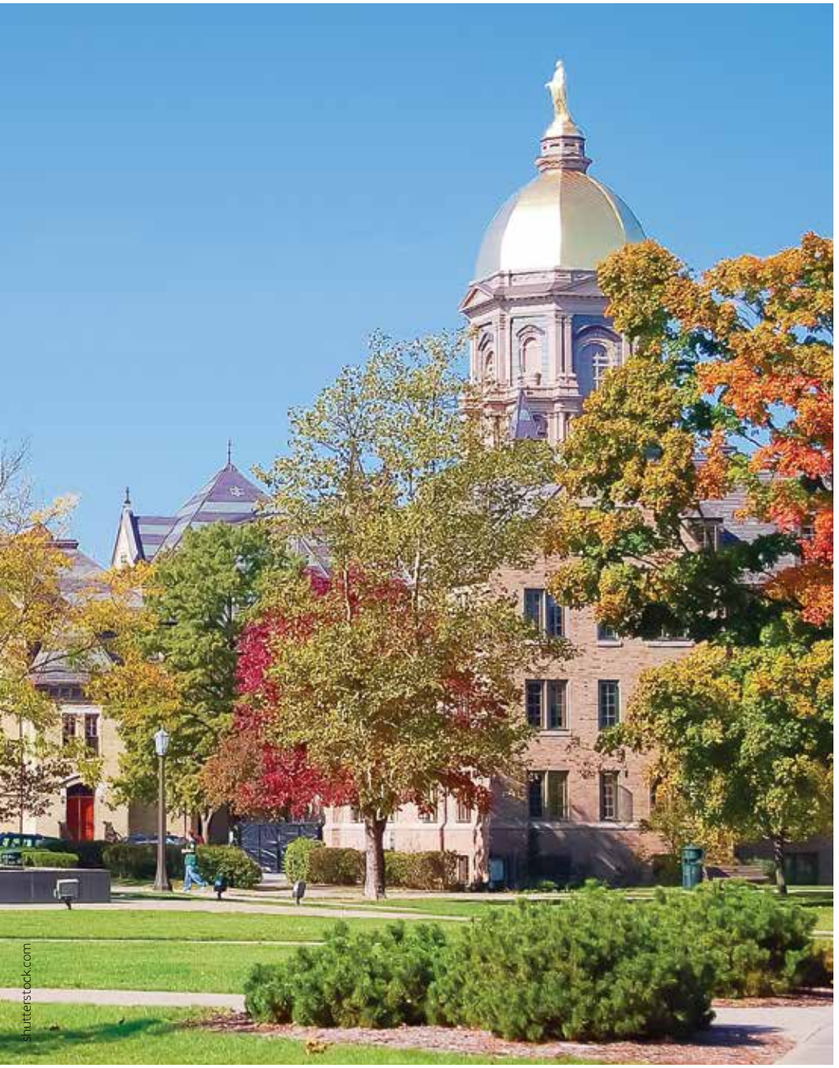
AT&T was the first telecommunications company in the world to establish an Emerging Device organization in 2008, which is now its IoT Solutions organization. AT&T connects more IoT devices than any other provider in North America, and supports a range of initiatives at higher education institutions. For example, a research department at one university is collecting agricultural data from sensors in the field to determine more efficient ways to grow crops.

Colleges are also using IoT to manage campus security and detect problems with on-campus infrastructure. The same approach can be used to spot anomalies such as excessive water use that could indicate a leak.

"On a large campus, having to monitor all of that geography, infrastructure, endpoints and rooms would take a massive amount of human and financial resources," says Nadir Khan, application sales executive, AT&T. "IoT enables a university to do that a lot easier and could potentially save a large campus millions of dollars."

Strategy 4:

Take Advantage of Collaborations



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In August 2016, Notre Dame announced a new online master's program in data science. The move was a significant shift for Notre Dame, which has historically focused solely on in-person student experiences.

"The university has been hesitant to create online courses and online degree programs," says Roger Woodard, inaugural director of Notre Dame's new program. "But we felt this was an important area to get into. The future is going to have to involve different types of learning in addition to the traditional classroom."

Woodard says data science was an obvious place to focus the first online program because of the growing demand for data science workers.

"Almost every industry now needs people that can deal with data at many different levels and who know how to make good decisions based on that data," says Woodard.

Starting an online degree program from scratch can be time intensive and expensive. Fortunately, AT&T stepped up to help Notre Dame design and develop the program.

"We want to make sure we understand what industry needs

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Collaborating to Expand Broadband Access: **AT&T and CENIC**

When California adopted the Common Core State Standards in 2010, the move prompted educators to push for more streamlined ways to assess student comprehension and fluency with multimedia and technology. Online testing was an appealing option. Before long, the state began developing a plan to ditch paper and pencils in favor of online assessments in all K-12 schools.

There was one major problem: Not all California schools had access to high-speed internet.

CENIC, a nonprofit corporation that provides high-bandwidth networking services to California's universities, colleges, schools and libraries, encouraged the state to address the need for infrastructure to support K-12 computer-based assessments. In the state's 2014-2015 budget, Gov. Jerry Brown included $26.7 million in one-time funding to support the Broadband Infrastructure Improvement Grant (BIIG) project. This project was so successful that the state allocated an additional $50 million in one-time funding the following year to continue this important work.

BIIG offsets the high construction costs that typically prevent schools in unserved and underserved areas from obtaining broadband. CENIC and the K-12 High-Speed Network (K12HSN) provide network design, manage a large consortia E-rate application for the participating schools, and handle project management, including coordination with commercial service providers. Once the services are installed and working, the schools receiving BIIG funding take over the ongoing monthly costs.

"There are rural communities in California where it would cost more money for any commercial provider to establish broadband service than it could recoup through selling services," says Sherilyn Evans, senior vice president and chief operating officer at CENIC. "BIIG is a solution for providing schools with broadband service. By funding the one-time construction costs, BIIG ensures affordable ongoing costs for participating schools."

Beyond enabling online testing, access to broadband provides students in rural and underserved urban schools access to online resources that can help them better prepare for the workforce.

"Broadband bridges distance," declares Evans. "It's that great equalizer. It can open wider opportunities in both education and the work world, especially for students in unserved and underserved areas of the state."

Successful implementation of BIIG required collaboration between CENIC and its many partners in state government, county offices of education, school districts and the broadband industry.

"Our relationship with commercial providers is critical," states Evans. "We don't have the expertise or the resources to handle the permitting and physical construction challenges that are common in unserved and underserved areas, so working with companies like AT&T is the only way we could make this happen."



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To date, BIIG has provided broadband connectivity to over 350 K-12 schools in California. While remarkable progress has been made, the group is still working to connect about 50 additional challenging schools, including two sites in a historically unserved area of Humboldt County, where AT&T is constructing more than 100 new poles for aerial fiber.

"Building out to these schools is proving to be time consuming and more expensive than anticipated," explains Evans. "For example, since the area receives a high amount of rainfall, soil erosion protection must also be installed around each of the poles. However, because the soil erosion protection requirement wasn't known up-front, AT&T is spending its own money to cover this cost and is committed to completing the project."

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and to train students to fill those needs," says Woodard. "AT&T input has been invaluable in letting us know where they see the industry going and how best to prepare our students."

Input from AT&T also helps Woodard develop agile learners who can evolve as data science evolves.

"Data science is changing constantly. There are vast numbers of new tools being developed and vast numbers of different types of problems being addressed," says Woodard. "Working with industry partners helps us develop students who will be good employees today, and good employees 10 or 20 years from now."

"Working with industry partners helps us develop students who will be good employees today, and good employees 10 or 20 years from now."

– Roger Woodard, Director of Notre Dame's Online Master's Program in Data Science

Notre Dame officially began classes in August 2017. Response has been overwhelmingly positive. Some of Woodard's students are already moving into new positions at their jobs though they have not yet completed the program.

"One of our students was a high school math teacher and now he's working for a data science company," says Woodard.



How Collaboration Changes the Game

Education organizations often provide free resources and programs to help students gain skills and connect educators. But when such organizations join forces with a private sector company, those efforts go even further.

AT&T has a long history of working with leading education organizations to enable better opportunities for students, such as:

State Educational Technology Directors Association (SETDA): SETDA is a not-for-profit that supports state education agency leaders. Each year at its annual conference, SETDA brings a group of students together to share stories about digital learning. After the conference, students tour Washington, D.C., and meet with policymakers on Capitol Hill. In 2018, AT&T is underwriting the Student Voices Program.

"It's a powerful opportunity for the students and policymakers to hear about digital learning in action," says Christine Fox, deputy executive director, SETDA.

Collaboration with AT&T also helps SETDA develop and share tech-based skills projects for students and teachers.

"Being able to leverage technology and create innovative content is critical to getting these students up to speed from a skills perspective," says Fox. "Working with industry partners is critical because it helps us understand what skills students need so we can prepare them for the workforce."

Consortium for School Networking (CoSN): CoSN is a professional association for school system technology leaders. Two years ago, CoSN launched a digital equity initiative to help strengthen home internet access.

"Most homework now requires access to the internet, particularly in the upper grades," says Irene Spero, chief strategy officer, CoSN. "But many children do not have home internet access. We feel this is the new civil rights issue of today — all students should have access to high-speed broadband for learning and research."

CoSN has been working on solutions that piggyback on existing infrastructure, build meaningful community partnerships and create tools to help district leaders get started in achieving digital equity. AT&T was one of the first organizations to get involved and has developed products and services for economically disadvantaged families as a way to close the homework gap.

"It's a perfect example of why collaboration with the private sector is important," says Spero. "As a nonprofit, we could never do this on our own. The corporate community has a great deal to contribute to discussions about how technology can transform education. It's about being involved, giving input and sharing resources."

National Career Academy Coalition (NCAC): NCAC is a nonprofit that provides collaborative support and resources for existing and emerging career academies.

Career academies within schools have grown quickly, but have primarily spread in a grassroots fashion. NCAC, along with other organizations, developed a set of 10 standards to ensure such academies meet specific criteria and focus not only on content, but on soft skills like communication, collaboration, critical thinking and creativity.

AT&T is one of many private sector businesses that partner with schools to help develop and deliver curriculum for these academies, and make workforce a primary theme. Private sector mentors also help students plan and prepare for the future with practicing mock interviews, writing effective resumes and dressing for success.

"It is key for businesses to engage with teachers to teach them what a true office environment or work environment looks like," says Jay Steele, executive director, NCAC. "Unfortunately, states only update their curriculum in three- to five-year cycles. Working with private sector companies is a way to keep curriculum and practices that are used in the classroom current, real and relevant."

Strategy 5:

Promote Equity



Photo courtesy of AT&T

Christine Livingstone is a teacher at Brogden Middle School in Durham, N.C., a school with many low-income, refugee and English as a second language (ESL) students.

"I have a lot of students from the refugee camps that were closed down in Africa, and they've had very little schooling," says Livingstone.

Livingstone is a strong proponent of using creative projects to help motivate and energize her students. For years, she compiled lists of projects she wanted to do or things she needed in her classroom. For a while, she purchased many of those "extras" herself. But when she added up her expenses at the end of one year, she discovered she had spent close to $3,000.

"That was a substantial chunk of my income," Livingstone says. "I used to think maybe I should get a job on the weekends at McDonald's — I could earn the money there and stop feeling guilty about it."

But then Livingstone discovered DonorsChoose.org, a program supported in part by AT&T through its Aspire initiative, that connects public school teachers with donors willing to help contribute to creative educational projects.

Improving the Nation's Graduation Rates

The average high school graduate can expect to earn an annual income of $30,627. That's $10,386 more than someone who does not complete high school. But graduation gaps persist between students of different races, ethnicities, income levels and special needs. Currently, one out of six students fail to graduate with their class. And of those who do, many are not properly prepared to continue their education.

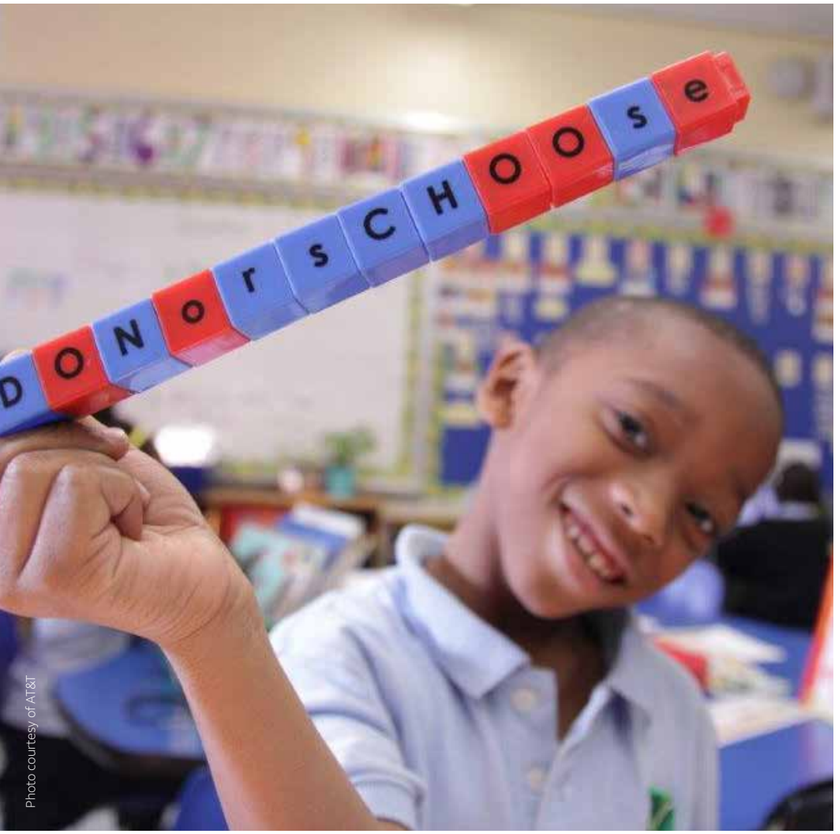
Through Aspire, AT&T supports programs that are improving the nation's high school graduation rate. For example, AT&T is part of the Grad Nation campaign to drive America to a 90 percent high school graduation rate by 2020. When Grad Nation launched the campaign in 2010 with AT&T's support, the graduation rate in the United States was 74.9 percent for the class of 2008. By 2016, the rate was at an all-time high of 84.1 percent.

It's not only about high school graduation. In 2013, students from high-income families were eight times more likely to have a bachelor's degree by age 24 than their peers from low-income families.[6] AT&T also supports Lumina Foundation's goal of increasing the number of Americans with high-quality postsecondary degrees or credentials to 60 percent by 2025.

"Statistics tell us that two-thirds of all jobs created in this decade are going to require some form of post-secondary education, whether that's a traditional four-year degree, community college, certifications or some other kinds of credentials," says Lake. "Today only about 45 percent of adults in the U.S. have achieved that level of education. We think by supporting those goals and encouraging other companies to support those goals, we can further this initiative and give opportunities to youth."

Did you know?

- The AT&T Aspire program aims to remove barriers to academic success and career growth and help all students — **regardless of age, gender or income** — achieve their goals.
- Sixty-one percent of Aspire students who were off track to graduate moved on track after one year in the AT&T Aspire program; **8 percentage points better than their peers**.
- AT&T also supports organizations and social entrepreneurs that **close representation gaps in technology, media and telecommunications** and that help underserved students develop computer science and coding skills, including All Star Code, Girls Who Code and Black Girls CODE.
- To celebrate a decade of AT&T Aspire, AT&T recently awarded **$9.25 million to 10 organizations** across the country who help underserved students stay in school and prepare for their next steps in their lives.



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“If a student is 14 and they’ve never been in a school before, you can’t give them the same type of a curriculum designed for the average seventh or eighth grader and expect that they’re going to go on and do well in high school.”

– Christine Livingstone, Teacher, Brogden Middle School, Durham, N.C.

“DonorsChoose.org allows me to have those extra things without working a second job,” says Livingstone. “My kids now have unique opportunities. There’s not a lot of times when they’re on that side of things.”

To date, Livingstone has devised and received funding for close to 300 DonorsChoose.org projects, including projects that encourage kids to master coding and math skills and rewards them with things like camping trips.

Workforce preparation efforts and strategies will only be successful if special attention is paid to the underprivileged and minority populations in schools. Today, more than half of public school students qualify for subsidized meals because of low family income. At Brogden Middle School, DonorsChoose.org has been critical to help build educational equity.

“If a student is 14 and they’ve never been in a school before, you can’t give them the same type of a curriculum designed for the average seventh or eighth grader and expect that they’re going to go on and do well in high school,” says Livingstone.

But participating in unique, hands-on projects motivates Livingstone’s students and helps gradually improve their skills and desire to learn.

“There are so many ways my students have been able to see the world in a different way because of DonorsChoose.org,” says Livingstone. “Things like a fish tank or a carnivorous plant collection or hatching praying mantis egg cases — those things engage them. Their world is already lacking in so many ways. DonorsChoose.org allows me to dream up cool projects and then enables me to deliver them to my students to keep them engaged and learning.”

Committed to Educational Equity: AT&T External Affairs

The AT&T External Affairs organization is dedicated to finding programs that share a commitment to helping students graduate from high school and prepare for the workforce or higher education.

On the East Coast, Marissa Shorenstein, regional president, AT&T external affairs, leads AT&T’s efforts to help local programs that further the education of students and create a pipeline of talent for the tech industry. Some of Shorenstein’s major programs include:

Girls Who Code: AT&T is one of the largest funders of Girls Who Code, a program that brings basic computer science and software engineering to underserved young women. The Girls Who Code Summer Immersion Program includes 20 10th- and 11th-grade students who learn to code and receive career exposure in the tech industry over seven weeks at the AT&T New York office in Rockefeller Center. Participating students create projects that include socially conscious websites, and games and devices. These include a website that serves as a database for mental health resources and a game that raises awareness about microaggressions in the workplace through a simulated interview. Throughout the summer, students meet with AT&T executives and learn through field trips to the AT&T Global Network Operations Center and the AT&T Lab.

All Star Code: Similar to Girls Who Code, but targeted at young African American and Hispanic males, All Star Code’s Summer Intensive is designed to empower young men of color with the skills, networks and mindsets they need to create new futures through technology. The program includes site visits as well as exposure to industry executives.

AT&T’s contribution helped All Star Code nearly double the size of the program in one year. In summer 2017, a class of 140 high school students completed the program.

On the West Coast, Ken McNeely, regional president, AT&T external affairs, looks for opportunities to help improve high school completion rates and build workforce and technology skills. Some of McNeely’s major programs include:

Proyecto Pastoral: Proyecto Pastoral supports and motivates underserved students in east Los Angeles, an area that has been significantly impacted by gangs, to stay in school through the Promesa Boyle Heights initiative. Since the initiative began in 2011, graduation rates at a high school the program serves — Gonzalo Mendez High School — rose from 30 percent to 96 percent.

Last year, Proyecto Pastoral was selected as one of 18 recipients nationwide that shared $10 million from AT&T through the Aspire Connect to Success Competition. Proyecto Pastoral was selected based on its effectiveness in helping students graduate ready for a career or college.

Bay Area Young Men of Color Employment Partnership (BAYEP): BAYEP helps engage businesses in hiring and retaining young men of color in the San Francisco Bay Area. Each year BAYEP conducts a Career Pathway hiring event focused on connecting young men of color to employment opportunities and community resources. The event includes participation from leaders and influencers from across the region and aims to connect 1,000 young men of color to career pathways each year.



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Conclusion: Breaking Down Barriers

Technology has made an enormous impact on the world, and the pace of change is likely to accelerate. Experts predict that by 2030, as many as 800 million jobs could be lost worldwide to automation. In the U.S. alone, between 39 million and 73 million jobs stand to be automated — comprising around a third of the total workforce.[7]

Yet, innovation will ultimately create new classes of jobs in areas like AI. A better educated workforce improves the chances an individual will be prepared for these disruptions and new types of careers.

It's not just about individual success. Preparing tomorrow's workforce for higher education, nanodegrees and careers also positions communities for prosperity.

The best approach is an agile one. Learning must be a continuous process. And it doesn't end with a college degree. Workers could potentially re-tool themselves multiple times in the future based on how the job market evolves and where future technology takes us.

To get there, education and training need to be fully accessible, and that means leveraging technology. Technology can empower students by giving them the tools, experiences and confidence to find a solution or solve a problem. Access to online tools, platforms and curriculum means students face fewer limitations on learning. This all hinges on collaboration between education and the private sector to make it happen.

"There are so many barriers in education — barriers of income, barriers of geography, barriers of access," says Lake. "Technology is the bridge that can help students overcome those barriers and connect with greater opportunities today and in the future."

Endnotes:

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