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Siemens Pathway to Learning Engineering

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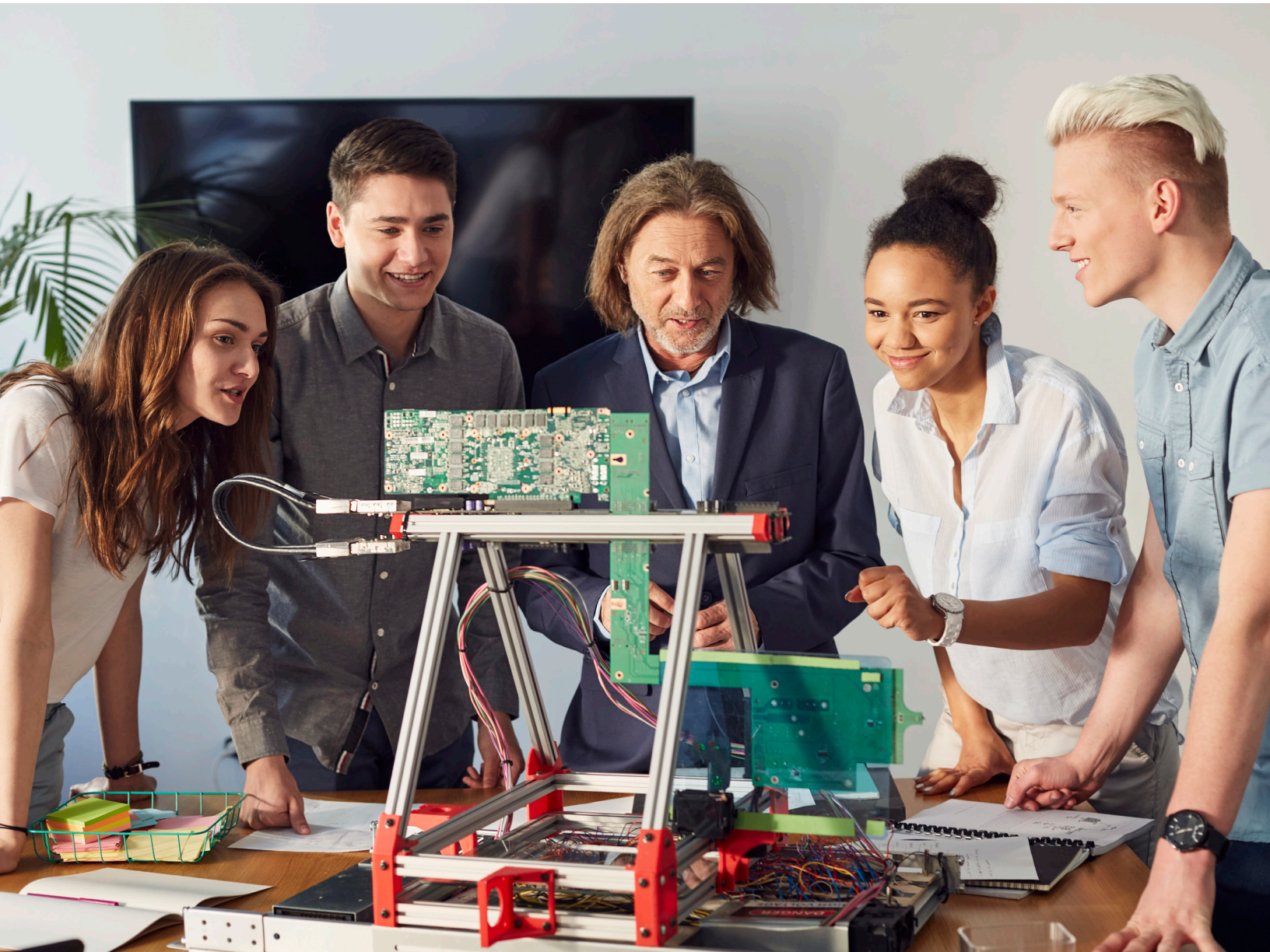


Siemens, a world leader in engineering and digital technologies, has significant interest and investment in the question: how do we advance engineering education? We aim to be part of the answer and have created a solution that reduces the barriers for educators to teach engineering.

Siemens Pathway is designed to empower educators by delivering a curated engineering learning program. Our turnkey solution drives 21st-century learning and includes all of the resources and support educators and students need, including a portfolio of industry software applications. Resources include educator training and professional development and standards-aligned student learning content designed to inspire students to careers in engineering and other STEM-related fields.

Why engineering?

Our world and all aspects of our lives depend on engineers. Engineers bring ideas to reality; they develop solutions to the world's biggest challenges and they fuel innovation to sustain and grow our economy.

The houses we live in, the roads we travel and the computers and technology we depend upon are created by engineers.

Engineers build bridges – literally and metaphorically – connecting our world, needs and futures. Engineers tackle the world's greatest challenges, developing solutions from exploring space to getting water to areas facing life-threatening shortages.

Engineering workforce shortfall is looming

At the moment when our global need for engineers is at an all-time high, our world's supply of trained engineers is at an all-time low. According to the U.S. Bureau of Labor Statistics, between 2016 and 2026 there has been and will be a shortfall of six million engineers or more.

Our world is facing a shortage of engineers. The engineering field suffers from three major challenges:

- Insufficient awareness of what engineers do
- Misperception of engineering
- A lack of opportunity for all to be involved in engineering

Many have taken notice of these challenges and the U.S. Department of Education has launched a nationwide initiative, YOU Belong in STEM, to encourage underrepresented students to pursue science, technology, engineering and mathematics (STEM) fields. Siemens supports this initiative and others like it globally.

Improving access to engineering

As one of the world's leading technology companies and an employer of thousands of engineers, and engineering-related workers, Siemens is committed to improving access to engineering. Regardless of previous technical background, academic course achievement or experience with engineering, we believe that anyone can be an engineer. Evidence is clear that all students are best when they have experiential learning experiences in STEM and every student should have the ability to pursue a career in engineering and STEM-related fields.

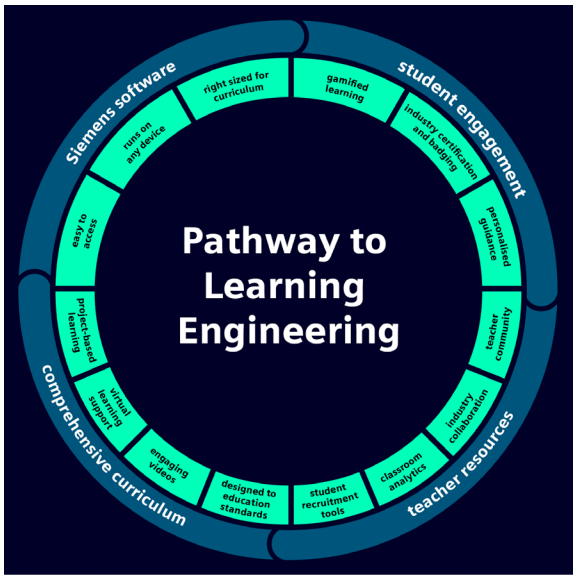
> According to a report by the World Economic Forum, there is estimated to be a global shortage of over 85 million skilled workers by 2030, with the largest gap in technology and engineering.

The K-12 education sector plays a key role in increasing interest, engagement and access to STEM fundamentals so that learners can acquire valuable skills, ways of thinking and habits of mind that will serve them well in their futures – regardless of their career or post-secondary choices.

A holistic approach to engineering and STEM education

Education needs more equitable and accessible STEM solutions. Siemens Pathway program creates access to engineering education in a way that removes the barriers and builds evidence-based best practices for teaching and learning.

Fully aligned to academic standards and industry needs of today and tomorrow, Siemens curated pathway offers interdisciplinary approaches so that students see themselves building skills such as critical thinking and social and problem-solving skills, which increase global awareness as learners work through real-world challenges. Each challenge helps to build technical capabilities with key engineering practices using industry-based tool and skill sets. Our gamified skill development approach empowers students by showing each skill they develop throughout the course and how those skills build mastery of a competency.



A unique experience for any student, Siemens Pathway provides career exploration and technical and 21st-century skills development.

Siemens' easy-to-implement program offers expert support for classroom educators through technical training, professional development, on-demand resources, detailed curriculum plans and an educator community. This program is a 21st-century education solution made for the learning environments of today.

Aligned with nationally recognized frameworks such as P21 and ISTE, the Siemens Pathway to Learning Engineering emphasizes collaboration, digital literacy and critical thinking.

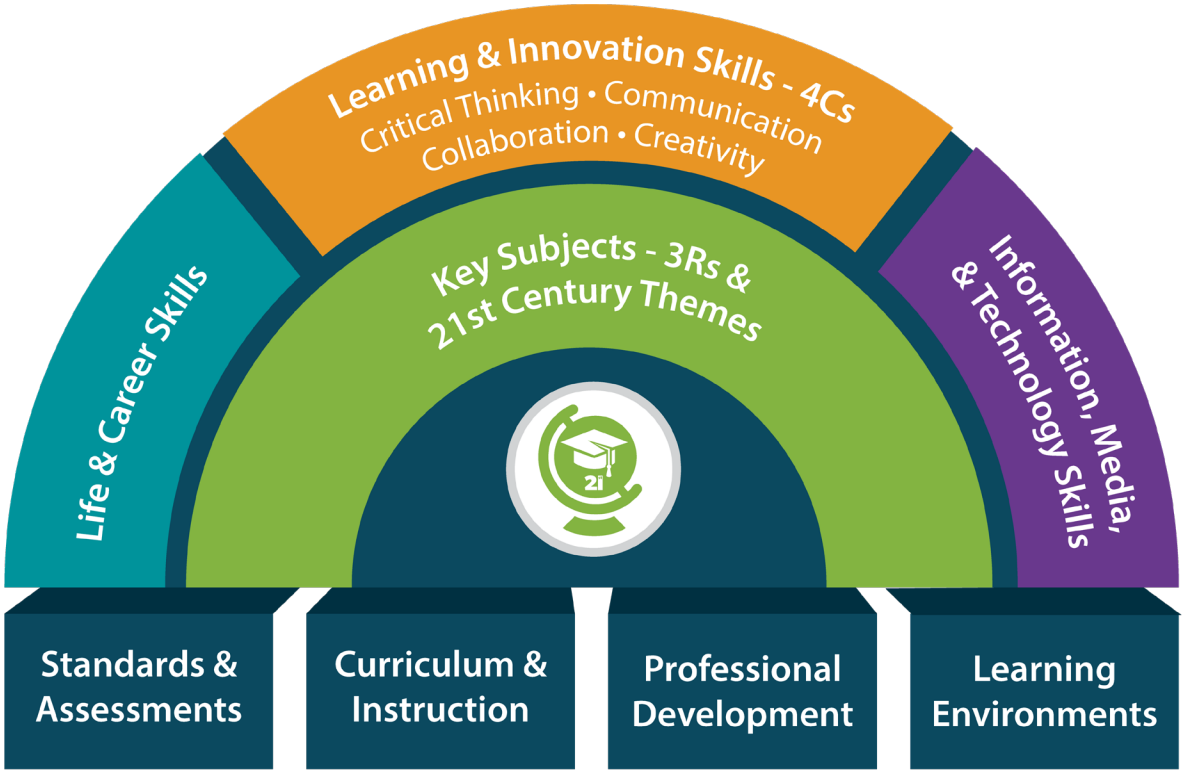
Career exploration

Students are far more likely to pursue STEM disciplines if they understand what careers connect to those fields of study. According to the National Center for Biotechnology information, exposing students to STEM careers can enhance their interest in pursuing careers involving science, technology, engineering and mathematics.

Siemens Pathway allows students to explore and emulate the work of various STEM professionals. From prototyping and automation to mechatronics and IOT, Siemens Pathway enables students to earn micro credentials and certifications and places them on a purposeful pathway to college and careers.

Building 21st-century skills

A common understanding of the knowledge, life and career skills, habits and traits, including collaboration, global awareness, creativity, perseverance, digital literacy and social responsibility have been deemed critical for student success in today's world. These skills and values create foundations for students as they move to the workforce, college and life as an adult.



Build a 21st-century skill set. ©2019, Battelle for Kids. All Rights Reserved.

Siemens Engineering Pathway for High School will prepare students to pursue STEM disciplines while providing an immersive experience and developing critical 21st-century skills that will serve them well throughout their lives in engineering or any career they pursue. The application incorporates the best use of technology for learning, such as skills-based gamified learning that allows students to see their active assessments and provides teachers with detailed analytics to pinpoint differentiation and provide personalized learning to all students.

Turnkey project-based curriculum

A common concern for project-based learning is that the work is front-loaded with the educator to prepare all student learning materials. We have removed this barrier by creating a turnkey project-based learning curriculum that includes differentiation for students and multiple instructional supports within the robust educator guides, ensuring an easier implementation for all educators. Real-world problems across various engineering disciplines are used to immerse students in authentic problem-solving experiences to build their individual and collaborative competencies using engineering processes.

Applying design thinking is a universal skill needed in various industries and is deeply embedded into Siemens Pathway. This skill set, along with others explored in the curriculum, is grounded in the concept that 21st-century problems require an ever-increasing digital skill set to develop ideas and solutions. Student learning is supported with embedded industry software tools that are right-sized for learning and grow in sophistication as students increase their skill to mastery level.

Siemens Pathway seamlessly delivers an online learning environment, professional engineering software and real-world learning experiences.

Curriculum overview

Siemens Engineering Pathway for High School is a four-year course of study presented as four single-year courses. Each course builds on the next and offers increasingly complex engineering problems for students to solve. Courses consist of multiple units, each with a unique problem, where students use sustained inquiry to create engineered solutions. Students are assessed for individual progress as well as group performance. Assessments are based on students' progress with specific engineering, academic and 21st-century skill competencies.

Students weave their worldviews, ideas and experiences into solutions for various engineering challenges to develop sustainable solutions for real-world problems.

Engineering Design
This course is the first in the four-year sequence and introduces students to core engineering practices. Applying the engineering design process, students work in teams to research, design, develop and communicate design solutions for real-world challenges. Additionally, students learn to use industry technologies such as professional 3D CAD software, which provides a path for them to attain industry certification.

Manufacturing and Automation
This course has students apply engineering principles and technical skills to design, plan and develop machining and automation programs. Students rapidly create, analyze and iterate proposed design and manufacturing solutions. Upon completion of this course students have the opportunity to pursue industry certification in Siemens automation technology: TIA portal and Simatic programmable logic controllers.

Mechatronics and IOT
This course requires students to collaborate in teams to research problems and design and develop mechatronic systems, including mechanical and electrical systems. Students build systems that focus on the Internet of Things (IoT), Industry 4.0 and human-machine interfaces (HMI), including PWM and PID control systems.

Engineering Research and Development
This capstone course calls for students to work in teams to design a business model for the creation of a real-world client product from beginning to end. Teams explore concepts of lean manufacturing and statistical process control (SPC) and how Six Sigma is used to minimize waste and maximize profits. At the end of the course students present the results of their research, prototype development, business plan and how they were able to optimize the process of manufacturing to an authentic audience.

Purchasing Siemens Pathway to Learning Engineering
Siemens Pathway is built to remove barriers to teaching by aiding the implementation of engineering education and seamless integration of software solutions that can empower educators to prepare students for rewarding careers in the engineering field.

The curated pathway includes project-based curriculum, industry software applications, educator resources and real-world student learning content.

For more information visit:
siemens.com/ple

Siemens Engineering Pathway for High School features:

Focus on 21st-century skills

- Engaging and accessible real-world learning
- Student-centered and standards-based learning
- Industry-based certification

Curriculum

- Standards-aligned curriculum and scope and sequence
  - International Technology and Engineering Educator's Association (ITEEA)
  - Next Generation Science Standards (NGSS)
  - Common core
  - P21 21st-century learning framework
  - ISTE Standards
  - National Assessment of Educational Progress (NAEP) and NAEP Technology and Engineering Literacy (TEL)
- Project-based learning curriculum design with built-in assessments
- Industry-relevant engineering scenarios and processes including project management

Digital technology

- Engaging and accessible learning with cloud-based digital technology
- Accessible and operable on any device
- NX, easy to learn and use 3D modeling and automated 2D drawings

Educator supports

- A standards-aligned transdisciplinary curriculum
- An accessible community of practice for educators
- Training and customized support for educators
- Job-embedded educator professional development and technical training

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Siemens Digital Industries Software helps organizations of all sizes digitally transform using software, hardware and services from the Siemens Xcelerator business platform. Siemens' software and the comprehensive digital twin enable companies to optimize their design, engineering and manufacturing processes to turn today's ideas into the sustainable products of the future. From chips to entire systems, from product to process, across all industries, Siemens Digital Industries Software – Accelerating transformation.

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