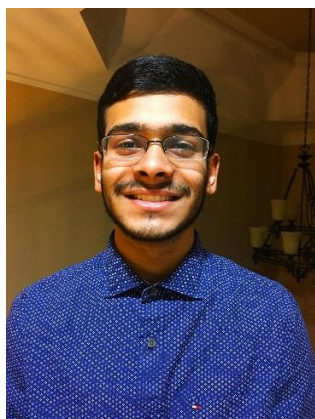


**2017 SIEMENS COMPETITION IN MATH, SCIENCE & TECHNOLOGY  
Regional Finalists – Georgia Institute of Technology**



**SAADH AHMED**

**SCHOOL:** Northview High School, Johns Creek, GA

**YEAR:** Senior

**HOMETOWN:** Johns Creek, GA

**PROJECT:** “Development of a Drug-likeness Rule Specifically Tailored for Natural Products to Assist in the Initial Processes of Drug Discovery”

**FIELD:** Biochemistry

**MENTOR:** Dr. Rao Mukkavilli, Georgia State University

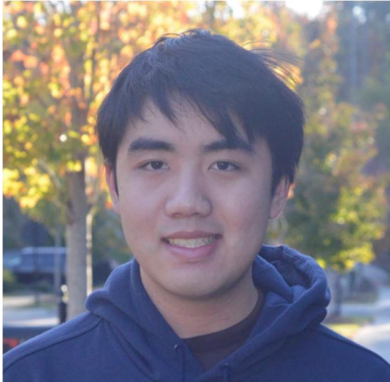
*“I believe that perfecting our current drug development process is the key to curing major diseases like cancer. Rather than looking to create extravagant treatments, I believe honing in our current drug discovery techniques can lead to a disease-free future.”*

Saadh developed a new rule than can be used to determine whether a natural compound, as opposed to a synthetic compound, has drug-like potential. The current guidelines used to determine drug-like potential often disregard natural compounds’ potential. Saadh’s ultimate goal is to help scientists implement this new rule on natural compounds to determine if they are truly drug-like or not. This could lead to the development of new and possibly more potent medicines.

He’s been interested in STEM subjects since the first grade and is very excited about the exponential growth in these fields throughout the past few years, leading to novel developments in medicine and technology that no one would have ever predicted could be achieved.

Saadh’s been drawn to cancer research. Both of his biology teachers in high school were cancer survivors, and hearing their stories inspired his pursuit to find a cure. He wants to work in the field of drug discovery to find effective ways to treat and eventually cure cancer. Saadh has been an honor roll student throughout high school, and is currently the president of his school’s Muslim Student Association.

An avid chess player, Saadh has placed in the top 30 players in his division at the national high school chess tournament. He loves coaching beginners in the game and studying different chess openings and game theories. Saadh is also an active member of his local mosque, where he participates in the youth club and studies religion with his peers, participates in public service and volunteer activities, as well as educating the public about Islam. Saadh is also a fluent Urdu speaker.



**KEVIN JIN**

**SCHOOL:** North Carolina School of Science and Mathematics, Durham, NC

**YEAR:** Senior

**HOMETOWN:** Davidson, NC

**PROJECT:** "Selective Recovery of Rare Earth Elements Utilizing Liquid Membrane Processes"

**FIELD:** Environmental Sciences

**MENTOR:** Dr. Heileen Hsu-Kim, Duke University

*"My fascination with electricity embodies my endless energy toward helping others in my community, mainly through using STEM."*

Kevin remembers traveling to China 10 years ago and being astonished by the country's poor environmental conditions. When he was there, the smog was so thick that the sky was only visible after it rained. He saw large coal ash landfills dotting the landscape, which he knew tainted drinking water with heavy metals and other contaminants. When Kevin returned to the U.S. and learned that the same dangerous landfills exist in this country from coal-powered electric companies, he was inspired to learn more about coal ash pollutants.

Through his research, Kevin found a way to effectively extract the elements from coal ash. He developed a process that uses liquid membranes to single-out rare earth elements, which are critical to the technological development in the energy and automotive industries. The US is currently seeking new sources of these elements so that they are not dependent on China, which controls over 80% of the world's production of rare elements. The effective and inexpensive method Kevin created has the potential to also help developing areas in countries like Vietnam and Brazil extract the elements for use and export, possibly improving their economies.

Kevin developed a passion for STEM at a young age. At six, he built his first computer. When he was 12, he joined a solar car club, and at 14, he pursued an independent research project to increase solar panel efficiency. This research evolved into Kevin designing new solar panel grid ideas for his community.

At school, Kevin enjoys studying chemistry and he hopes to one day become a researcher. His favorite book is *The Science of the X-Men*, which explores the possible scientific explanations for X-Men mutations. Kevin cherishes his time spent with friends and family, and his older brother is his role model.



**KARNA MOREY**

**SCHOOL:** North Carolina School of Science and Mathematics, Durham NC

**YEAR:** Senior

**HOMETOWN:** Durham, NC

**PROJECT:** “Scalar Radiation from a Charge in Schwarzschild Spacetime: Circular Orbits”

**FIELD:** Physics

**MENTOR:** Dr. Jonathan Bennett, North Carolina School of Science and Mathematics and Dr. Charles Evans, UNC Chapel-Hill

*“I have never considered myself naturally intelligent; I have always considered myself naturally curious. My grandfather instilled in me the belief that it is more important to ask good questions than to know good answers. I believe that the scientific process of asking questions is just as important as being able to answer them through the research process.”*

Karna used a new method to theoretically predict the gravitational waves emitted from two black holes that are orbiting around one another. His interest in the topic was sparked by an article that his cross-country coach shared at practice during his sophomore year that described the detection of the first gravitational wave by the Laser Interferometer Gravitational-Wave Observatory (LIGO) collaboration. He was immediately transfixed and poured himself into reading up on gravitational waves. He was further inspired by a schoolmate who was researching black holes and gravitational waves that were scattered off Schwarzschild black holes—the simplest kind of black hole with mass, but with no electric charge and no spin. Karna has spent many months working his project over the past year. Although he faced numerous challenges that required long hours and late nights, he says it was incredibly rewarding.

Karna runs cross country for his high-school team, where he has served as co-captain for two years, and he is most proud of improving his 5K time by four minutes. He is a fan of the Czechoslovak runner Emil Zatopek, who is famous for winning three gold medals at the 1952 Olympics, and his mental toughness.

Karna looks to former president Barack Obama as his role model for intelligence, leadership, and poise. “He inspires me to think about others and how I can be a better community member, and if one has hope, good luck, and the ability to work hard, that you can do anything that you put your mind to. I admire his ability to bring out the best in people and inspire others for the common good.”

Karna gives back to his community, tutoring elementary and middle-school children in the region. He has played classical guitar since he was four years old and enjoyed learning the music of Bach and Vivaldi. He appreciates the work of feminist singer Daya, “because she speaks out against misogyny and injustice, and is a role model for males and females alike.”

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**JAEWON SUNG**

**SCHOOL:** McCallie School, Chattanooga, TN

**YEAR:** Senior

**HOMETOWN:** Seoul, South Korea

**PROJECT:** "Improving Overfitting In Deep Learning Through A Generative Adversarial Network"

**FIELD:** Computer Science

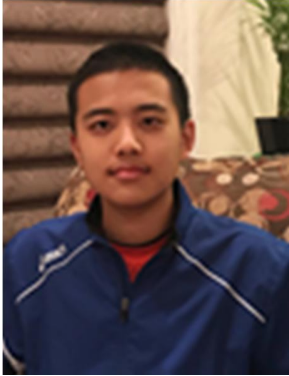
**MENTOR:** Dr. Kwonmoo Lee, Worcester Polytechnic Institute

*"When I saw two different methods that were used to enhance machine learning performance, I thought to myself, is there a way to combine these and make it even better? And it is that question that made all the difference."*

Jaewon Sung is a huge fan of the New England Patriots because Massachusetts was the first place he lived when coming to the United States. He is not only a Tom Brady fan, but a fan of all athletes in general, because he sees the passion in their eyes, their moves, and their plays. Passion, he says is something that scientists share as well, and he learns from athletes' focus and interest in being the best they can be each day.

Jaewon is passionate about finding a way to perfect Artificial Intelligence (AI) to improve voice recognition and prediction. The better AI becomes, he says, the more we will use big data to solve many of the world's problems. For his Siemens' research, he merged two different ways to make AI predict data better, making it faster, more efficient, and more accurate.

Jaewon was on the distinguished honor roll for the 2017 American Math Contest. He is a member of a Multicultural Culinary Club and a varsity rower for the crew team. He also loves to play ice hockey. His favorite writer is Ernest Hemingway for his concise and graceful writing, and favorite musician is Chance the Rapper for his positive lyrics.



**FRANKLYN WANG**

**SCHOOL:** Thomas Jefferson High School for Science & Technology, Alexandria, VA

**YEAR:** Senior

**HOMETOWN:** Falls Church, VA

**PROJECT:** "Monodromy Groups of Indecomposable Rational Functions"

**FIELD:** Mathematics

**MENTOR:** Professor Michael Zieve, University of Michigan

*"My favorite kind of mathematical result is one which claims to deduce a lot of information from very little. These results never fail to captivate me, since they are genuinely surprising and their proofs are often delicate works of art."*

Franklyn became interested in math in the 7th grade when he participated in the MATHCOUNTS National competition. To this day, his MATHCOUNTS coach, Mrs. Clark, remains an inspirational role model in Franklyn's life as she is a dedicated and hardworking volunteer, spending countless hours with students.

Franklyn's interest in math led him to address a problem that has puzzled mathematicians for almost 100 years. Building on several previous results, Franklyn's work brings this problem near completion. His findings have a wide range of potential applications, from creating faster, more secure algorithms for telecommunication to designing safer infrastructure, like bridges resistant to strong winds.

Franklyn has participated in many math and science competitions. He was recognized as a finalist at the 2017 USA Computing Olympiad, placing him in the top 26 among all high school competitors in the country. Franklyn also serves as captain of his school's National Science Bowl team, which placed 2nd at the national competition in 2017. He has participated on his school's Physics team, where he has competed nationally, winning a USA Physics Olympiad Gold Medal in 2017.

Outside of math and science, Franklyn enjoys watching the New England Patriots and listening to Taylor Swift's music. He hopes to be a researcher in math, computer science or economics, using artificial intelligence and machine learning to solve problems facing mankind.

## TEAM COMPETITORS

**SHINBE CHOI**, McLean High School, McLean, VA

**KELLY CHO**, Thomas Jefferson High School for Science & Technology, Alexandria, VA

**JUNHYUN CHONG**, Thomas Jefferson High School for Science & Technology, Alexandria, VA

**PROJECT:** “Portable Chemiluminescent Biosensor Capable of Rapidly and Simultaneously Determining HIV and HCV Infections in a Sample”

**FIELD:** Biochemistry

**MENTOR:** Dr. Ji Hoon Lee, Luminescent MD

Shinbe, Kelly, and Junhyun developed a new and easier way of detecting HIV and Hepatitis C that only requires certain chemicals, a smartphone, and a dark room. The team hopes that a detection method that uses everyday technology can be used in more underprivileged, low-resource settings.



**SHINBE CHOI**

**YEAR:** Senior

**HOMETOWN:** McLean, VA

*“I love biology because it excites me to better understand the complex details and mysteries behind the structure and function of our bodies.”*

Shinbe has been interested in the natural sciences since he was young. Dissections were always his favorite activities in biology class and he has always loved studying anatomy and physiology. However, the biggest catalyst for his interest in health occurred when his grandmother began to suffer from Alzheimer's disease. Losing his grandmother to the disease spurred him to study medicine and he wants to become a physician.

Outside of his studies, Shinbe is most passionate about volunteering with special needs children because he loves being able to help them have fun for even short moments despite their difficult situations. Shinbe is an officer for his school's Science Olympiad and is also the vice president of its Statistics Club.

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**KELLY CHO**  
**YEAR:** Senior  
**HOMETOWN:** McLean, VA

*"I'm most passionate about finding solutions that allow people to have the same opportunities regardless of race or income."*

Kelly has always been interested in STEM education. Biology has been her biggest passion because even when she's reading the most advanced textbooks she is fascinated by the holes in discovery that still exist. She also loves how biology research builds creative, scientific thinking.

Kelly is passionate about spreading the message of safe sex, and hopes the device her team created can someday help more people get tested for sexually transmitted diseases and stay healthy.

Outside of biology Kelly is also very interested in global studies—both government and languages—because the topics allow her and her peers to freely discuss issues impacting the world today. When she grows up, Kelly wants to find a career that she loves, can immerse herself in and find fulfilling, whether it's lab-based, law-based, or community service-based.

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**JUNHYUN CHONG**

**YEAR:** Junior

**HOMETOWN:** Vienna, VA

*“In math, I love the fact that every problem can be solved systematically and it makes sense.”*

Junhyun’s passion for STEM took off when he entered high school and found himself surrounded by peers with similar interests. His interest in research grew after taking lab courses, which inspired him to pursue a research experience that he could apply to real-world issues. With his teammates, they did just that by developing a new way to detect HIV and hepatitis C.

Junhyun has always loved to solve math problems; he loves that there is always another method to solve a problem if you get creative.

Junhyun also has a deep interest in woodworking and building robots. It’s his passion for building that helped him create his team’s medical device. He wants to continue to lend his skills to the medical community and one day hopes to be a biomedical engineer.



## TEAM COMPETITORS

**RYAN LI**, Walton High School, Marietta GA

**WILLIAM ELLSWORTH**, Walton High School, Marietta, GA

**PROJECT:** "Parkinson's Disease: Identification of Novel Metabolic Biomarkers for Early Diagnosis"

**FIELD:** Biology

**MENTOR:** Dr. Gary Miller, Emory University

Ryan and William discovered new chemical markers in the blood that correspond to Parkinson's disease and then created an algorithm to diagnose Parkinson's based on the levels of these chemicals. Their research could lead to improved diagnosis and treatment for Parkinson's disease.



**RYAN LI**

**YEAR:** Junior

**HOMETOWN:** Marietta, Georgia

*"What I think is so interesting about science is that it's a field where I can solve problems to help people."*

Ryan is passionate about science and developing new treatments for diseases that save lives. He was inspired to research neurodegenerative diseases, such as Parkinson's, after his grandmother was diagnosed with dementia.

At school, Ryan's favorite class is AP Chemistry because it mixes problem solving with real-world scientific knowledge. He is active in a number of extracurricular activities, including photography, and he is the president of his school's chapter of Habitat for Humanity and vice president of the Model UN team. Ryan has been recognized four times as Outstanding Delegate at various Model UN conferences and was a PTA Reflections Area Winner for his photography.

Ryan's favorite books are the fantasy novel series, *A Song of Ice and Fire*, and his favorite band is ODESZA. His role models are his parents, who encourage him to do what he loves and try his hardest. Ryan hopes to have a career in a human biology-related field that involves clinical research.



**WILLIAM ELLSWORTH**

**YEAR:** Junior

**HOMETOWN:** Marietta, Georgia

*"I am most passionate about helping people with neurodegenerative disorders. I empathize with the struggles of such patients and hope that one day I can help improve their quality of life through working as a doctor and researcher."*

William has always wanted to research neurodegenerative diseases ever since his grandmother was first diagnosed with Alzheimer's. He hopes to one day become a neurologist and continue helping people affected by serious neurological disorders.

William's favorite school subject is biology. Outside of the classroom, he is class president, president of his school's neuroscience club, and active in the Science Bowl team, Science National Honor Society, and singer songwriter club. William is also the director of Handwritten Change, a small unincorporated nonprofit dedicated to political advocacy and civic engagement. Handwritten Change maintains a website and hosts letter-writing events that help connect individuals with their elected officials to urge policy change.

William's proudest accomplishments include being a USA Biology Olympiad National Finalist and officiating the wedding of his former middle school biology teacher and former middle school principal. His role models are his parents because they are incredibly kind and supportive.

## TEAM COMPETITORS

**GABRIELLE LIU**, Ravenwood High School, Brentwood, TN

**ALLEN LIU**, McCallie School, Chattanooga, TN

**PROJECT:** "Neural Networks without Multiplications"

**FIELD:** Computer Science

**MENTOR:** Peter Lowen, Ravenwood High School

Gabrielle and Allen developed a neural network architecture that runs faster than traditional neural networks by replacing multiplications with simpler operations. Neural networks are interconnected computer systems that use machine learning to progressively learn patterns and relationships in data. The research could lead to improvements in data processing speed and make artificial intelligence more accessible.



**GABRIELLE LIU**

**YEAR:** Junior

**HOMETOWN:** Nashville, TN

*"The beauty of mathematics fascinates me, and I love to look for patterns among numbers. I also love the diversity of mathematics – there is always another problem to think about, another challenge to conquer."*

Gabrielle is most passionate about mathematics and artificial intelligence. She's always enjoyed the process of discovery – testing her interests and theories through the scientific process. She has been sharing her research at science fairs since sixth grade. Gabrielle was named a Broadcom MASTERS semifinalist and won the Grand Prize at the Middle Tennessee Science and Engineering Fair. In 2017, she was recognized as a semifinalist at the USA Biology Olympiad and a finalist at the Intel International Science and Engineering Fair.

Gabrielle is a member of her school's Forensics/Speech and Debate Team. In fact, one of her proudest accomplishments is her perseverance in advancing from last place in her very first speech tournament to placing top five in the statewide competition a year later. Gabrielle is also the founder and president of the Computational Biology Club, a volunteer in the Amateur Radio Emergency Service, and a member of the Nashville Fencing Club. In her spare time, she enjoys playing the violin/fiddle and tinkering with fashion.

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**ALLEN LIU**

**YEAR:** Senior

**HOMETOWN:** Chattanooga, TN

*"I'm passionate about scientific research, but it all began with math competitions. The thousands of hours practicing problems and studying proofs endowed me with the passion for inquiry. Asking the 'what if?' and 'why?' questions, through the application of fundamental ideas, lead me to electrifying epiphanies."*

For Allen, math and music have always been connected pillars of his life. In fact, Allen first learned of the Siemens Competition while at a summer music program. Allen is a classically trained violinist and has performed at Carnegie Hall with the National Youth Orchestra. He has also served as concertmaster of the Tennessee All-State Symphony Orchestra, and he regularly organizes concerts and community projects as an intern with String Theory, a chamber music concert series based in Chattanooga that has performed across the country.

Allen's interest in science has led him to placing in the Top 150 in the United States National Chemistry Olympiad. He is also the captain of his school's Science Olympiad team and a founder and coach of a MATHCOUNTS team at a local middle school.

Outside of the classroom when he isn't playing violin or listening to Tchaikovsky, his favorite composer, Allen serves as the President of his school's Young Democrats Club and has volunteered for several local campaigns. He's also a co-captain of the Mock Trial team, which placed 7th in the state of Tennessee.

## TEAM COMPETITORS

**SURBHI MATHUR**, Loudoun Academy of Science, Sterling, VA

**JANIE WU**, Loudoun Academy of Science, Sterling, VA

**PROJECT:** "Developing a Low Cost, Non-invasive Colorimetric Assay to Determine Atherosclerotic Burden"

**FIELD:** Chemistry

**MENTOR:** Dr. Michael Tomlinson and George Wolfe, Director, Loudoun Academy of Science

Surbhi and Janie developed a color-based dip strip test for urine that is less expensive and easier to perform which can predict a person's risk level of heart attacks and strokes.



**SURBHI MATHUR**

**YEAR:** Senior

**HOMETOWN:** Ashburn, VA

*"I aspire to be in a career where I can make an impact on other people's lives, whether that be through medicine or any other field."*

Surbhi has always enjoyed STEM subjects, and was a very inquisitive child especially interested in science. She loves psychology because she likes to understand why we think and act the way we do. She and her teammate had an interest in health issues, and Surbhi hopes to have a career in science or medicine.

The inspiration for Surbhi's and teammate Janie's research project was wanting to make a difference in other people's lives. Their research could lead to early detection of atherosclerosis, which may lead to a decrease in unexpected heart attacks and strokes that often take people's lives without warning. Surbhi cares passionately about people, and finds strength and guidance from family and friends. She has been attending the Academy of Science since her freshman year in high school which solidified her interest in science.

Surbhi loves dance and debating in Model U.N. She was a National Merit Scholarship Semi-Finalist and Yale Science and Engineering Association Best in Fair winner.

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**JANIE WU**

**YEAR:** Senior

**HOMETOWN:** Ashburn, VA

*"We discovered a new use for two chemicals that could be used in a color-changing test strip to tell someone their level of risk for cardiovascular disease."*

When she was eleven years old, Janie's grandmother passed away unexpectedly and suddenly from an aneurysm due to a condition called atherosclerosis. Her grandmother had no symptoms, a common characteristic of this illness that affects people around the world. Janie wanted to combat this with a way to assess the risk early and easily of heart attacks or strokes. Together with her teammate, she developed a simple dipstrip risk assessment test that is accessible to anyone.

Janie is driven to serve others, and organized a fundraiser at her school for an eleven year old girl from Zimbabwe so she could go to school. In three weeks, she raised enough money to send the young girl to school for five years.

She has been an ice skater since age five, and loves to teach children to skate. She is active in student government, academic team, and a variety of honor societies. She is considering law or medicine as a career.

## TEAM COMPETITORS

**ALICIA PAN**, Madison High School, Vienna, VA

**ALLEN PAN**, Madison High School, Vienna, VA

**PROJECT:** “New Structure and Energy Cycles of Kinesin Dimers Walking on Microtubules Revealed from Molecular Simulations”

**FIELD:** Biology

**MENTOR:** Dr. Xiongwu Wu, National Heart, Lung, and Blood Institute, National Institutes of Health

Alicia and Allen researched and discovered a new walking mechanism for the motor protein kinesin. They also identified a new form of the protein that can be targeted by anticancer drugs.



**ALICIA PAN**

**YEAR:** Junior

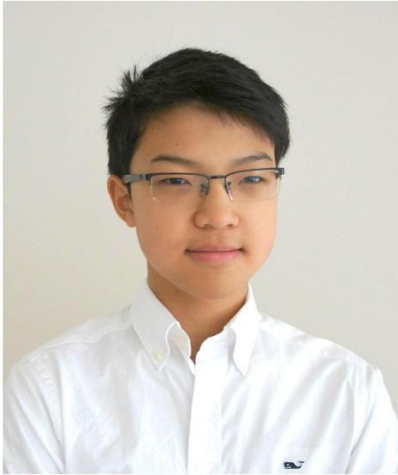
**HOMETOWN:** Vienna, VA

*“I am most passionate about girls in STEM and working to close the gender gap in the STEM fields.”*

Alicia developed an early interest in biology that stemmed from both of her parents love and focus on the subject in college. Her family’s dinner table conversations revolved around gene mutations and protein structures and her early reading included MUSE, a science magazine for kids. Alicia developed an interest in technology after attending her first hackathon at the age of 12, and ultimately founded her school’s “Girls Who Code” club during her sophomore year, where she worked with her school to provide students with an accessible coding curriculum.

Working to close the gender gap in STEM is a big issue of interest for Alicia and led her to found the Girls Who Code club. Alicia is also the Chairman of Community Service Projects for the Future Business Leaders of America club and has worked with Project ASK, The Association for the Support of Children with Cancer. She credits her science teacher, Mrs. Kreit-Wright, with inspiring her interest in molecular biology.

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**ALLEN PAN**

**YEAR:** Freshman

**HOMETOWN:** Vienna, VA

*“Before I became a Boy Scout, I pledged my honor on the scout’s oath, which included, ‘On my honor, I will do my best to help other people at all times.’ Remembering this oath, my drive to improve the lives of others led me to research kinesin because of its important role in the development of cancer.”*

Allen, just like his sister who is his Siemens Competition partner, has been interested in science from a very young age. He grew up watching science television series like *Bill Nye the Science Guy*. Not only was science an educational topic for him, but he has always had a tremendous amount of fun with it. Biology is Allen’s favorite subset of science, finding a variety of fascinating insights in his learnings.

Allen is very active in school and extracurricular activities. He was elected troop representative for the Order of Arrow Honor Society and is also the patrol leader for Boy Scout Troop 345 where he planned and led patrol meetings and activities and represented his patrol in all leaders’ council meetings. Allen works with experienced camp instructors to become a positive mentor and coach for kids as the counselor-in-training at Camp Invention, a summer camp where kids explore connections between science, technology, engineering, and innovation.