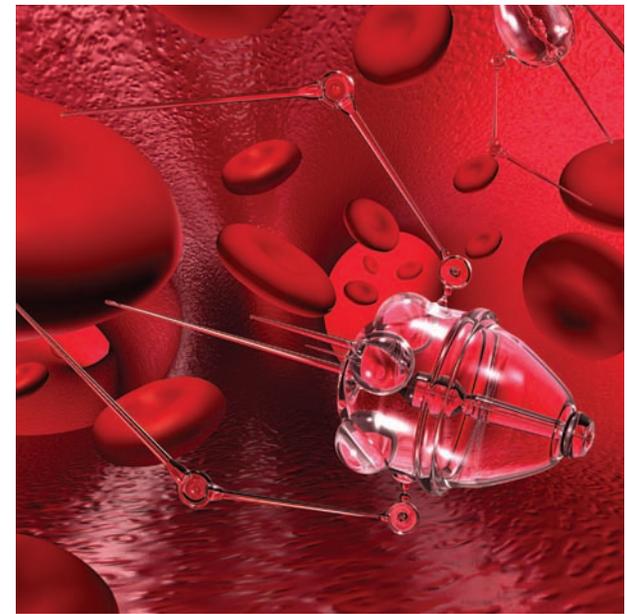
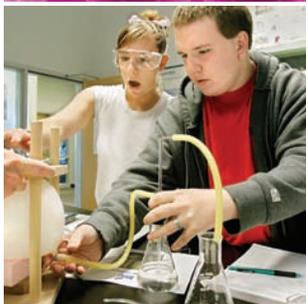
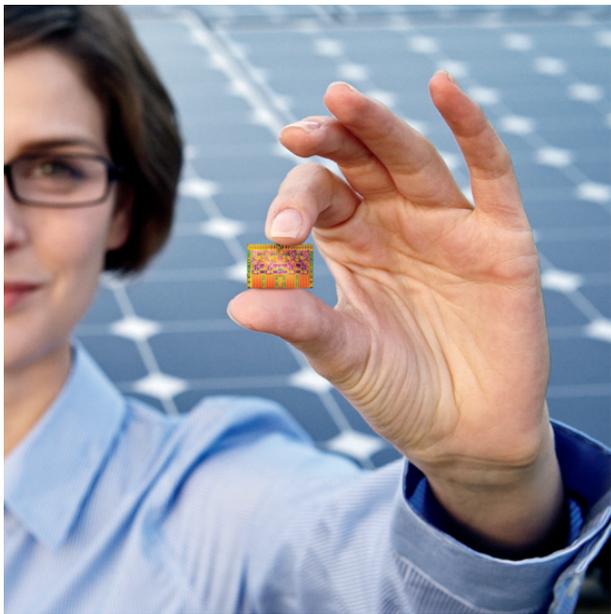




# InnovationHS

Engineering and Biomedical Sciences for High Schools

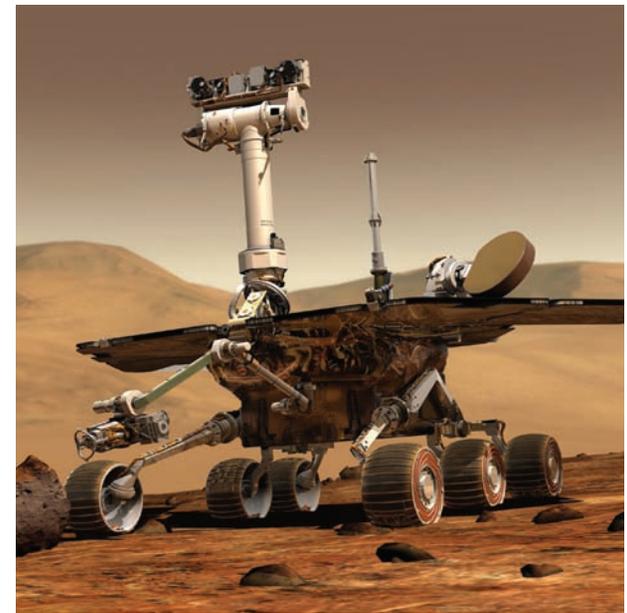
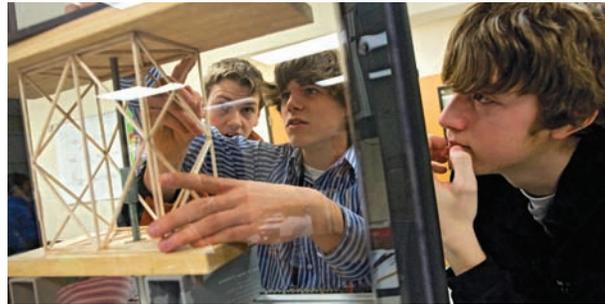




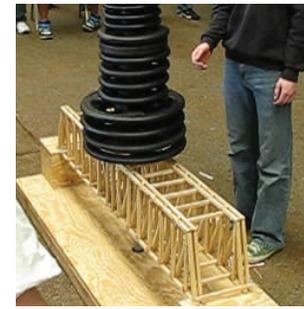
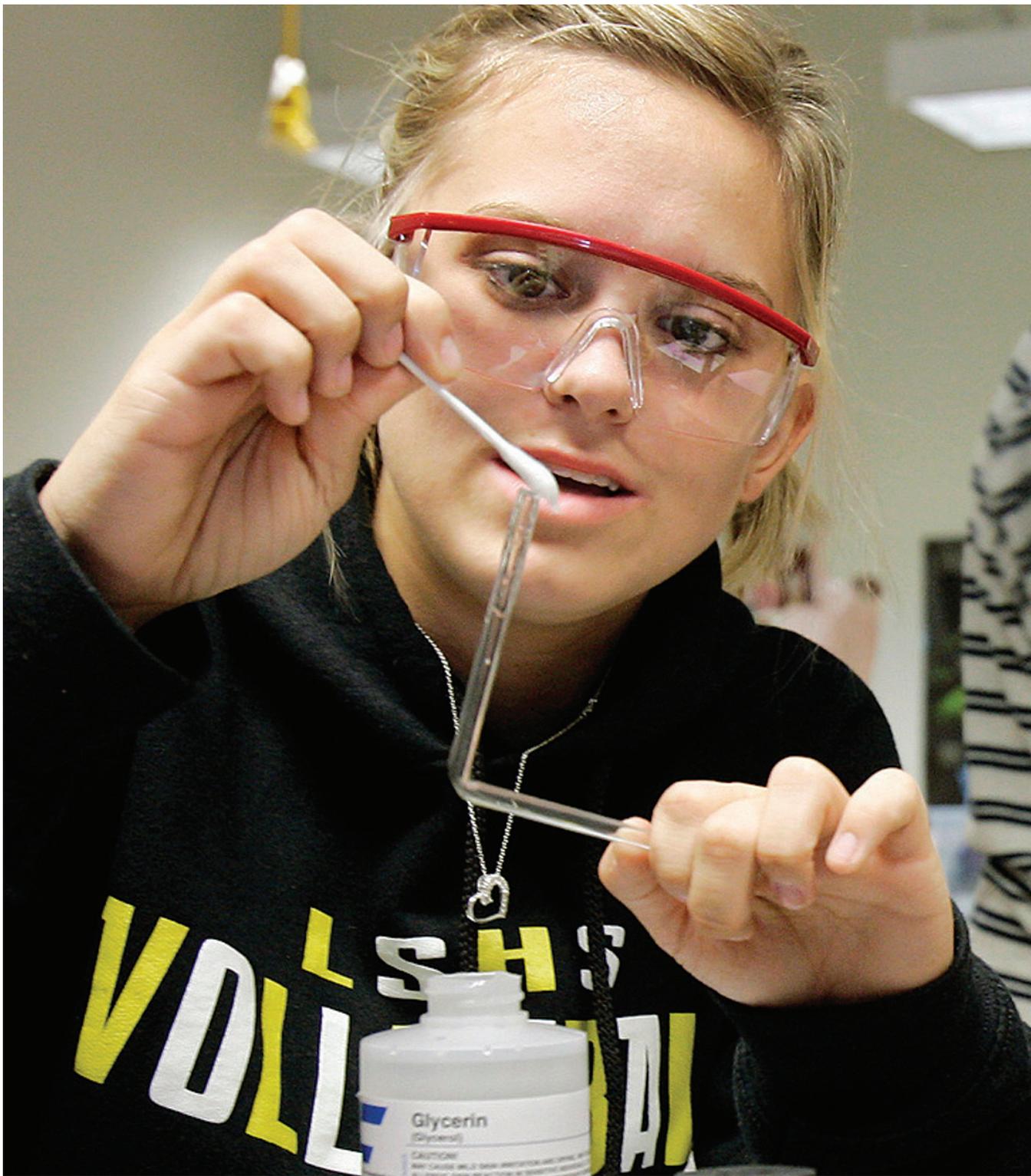
# Welcome to the innovation

Imagine a car that could morph its shape based on the driver's whims. What if satellites had metallike skins that could repair themselves from damage in space? What if old high-rise buildings could be turned into vertical farms to help fight world hunger? Picture a 3D cell-phone screen strapped to your wrist. How about turning pond scum into green fuel? Or rearranging the molecules of your blood to fight off deadly diseases? These and countless other life-changing innovations are taking shape in labs, in test tubes and on computer screens by engineers and scientists around the world. But they all have one thing in common. They all come from imaginative thinking. Right now there's a classroom in your school where you too can begin to dream up tomorrow's wonders – a space of imagination, innovation and learning that could only be called an Innovation Zone.

# zone.



PLTW classrooms are in more than 4,000 schools in all 50 states, serving more than 350,000 students. And each one of them is an Innovation Zone.





Get ready to ignite the most  
powerful thing you have

**your imagination.**

It's a classroom that's unlike any other you've ever been in. A space filled with the latest design software, advanced materials and cutting-edge equipment. It's a place that's buzzing with project-based assignments, like programming robots and analyzing DNA samples. Where facts and figures are turned into ingenuity and inventiveness. Where the four walls of the classroom open up and lead to real-world challenges and opportunities – from energy and the environment, to housing and healthcare, to transportation and technology.

It's collaborative. It's creative. It's critical thinking. And it's all centered on the most vital fields of learning and essential professions needed in the world today and tomorrow. What educators call STEM, which stands for science, technology, engineering and mathematics. It's a PLTW classroom – aka Innovation Zone. Step through the door, and you'll experience an approach to learning that fuels imaginative thinking, creative problem solving and innovative solutions – just the kinds of skills that will help you succeed in your education and beyond.



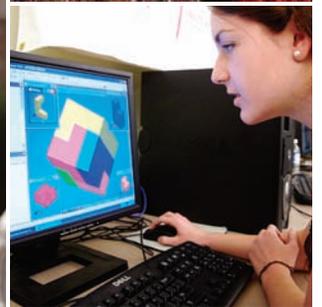
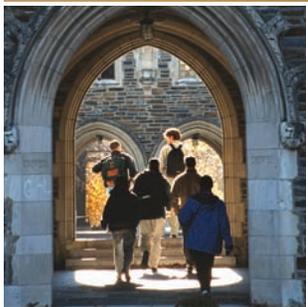
Not just an innovative and  
rigorous STEM course but a

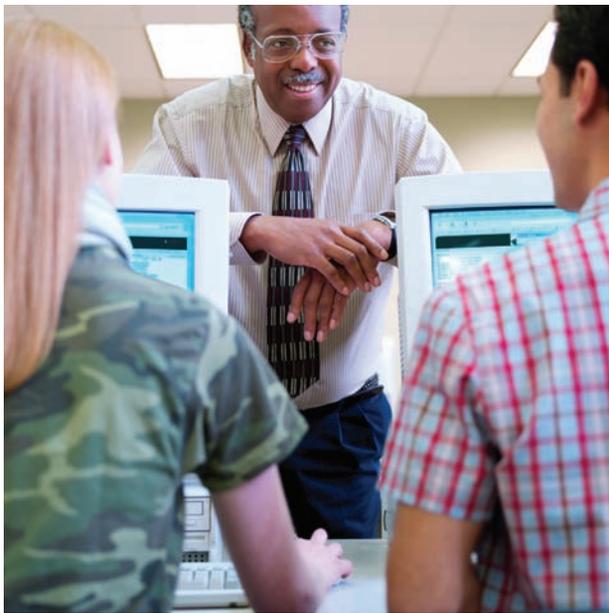
pathway to the future.

About 90% of PLTW students surveyed at the end of their senior year said they had a clear sense of the types of college majors and jobs they intended to pursue.

The PLTW program is designed to serve high school students of diverse backgrounds, helping them all to become college and career ready, from those already interested in STEM-related fields to those who are more inspired by the application of STEM than they are by traditional math and science courses. PLTW classes are taught in school during the school day, and every PLTW instructor receives extensive training as well as ongoing support in the courses they teach. While the STEM subject matter is rigorous, the approach is

never rigid. That's because the PLTW program provides a flexible curriculum platform along two tracks, engineering and biomedical sciences, which schools can customize to meet the specific needs of their academic environment. In addition, PLTW schools can tap into the generous support and active involvement of some of America's leading corporations, philanthropic foundations, and prestigious colleges and universities. Their efforts help ensure that PLTW classrooms have the latest technology, materials and equipment, and that PLTW students are learning the latest information found





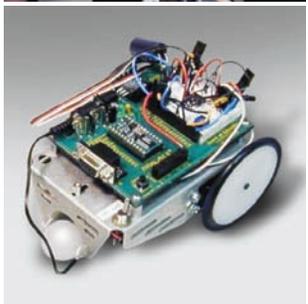
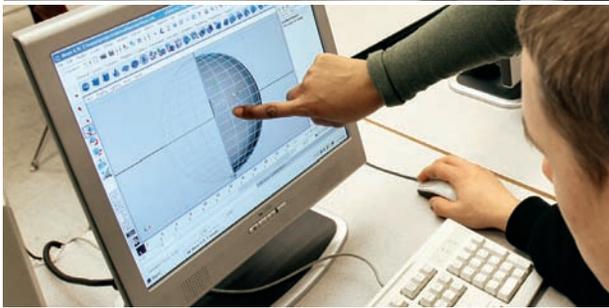
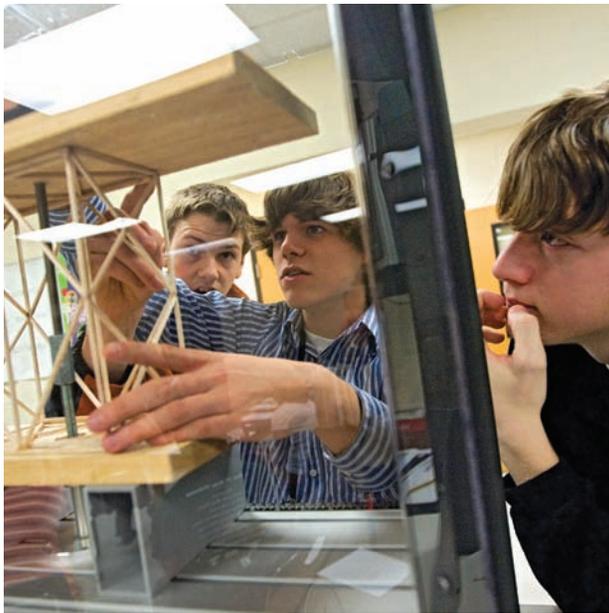
in such fields as biotechnology, information technology, engineering design, architecture and aerospace. They provide assistance with the development of PLTW coursework and, in the case of universities, opportunities for college credit.

Annual studies and surveys of the PLTW program have shown it to be a launching pad for college and professional careers and a boost for academic performance. PLTW students achieve significantly higher scores in reading, mathematics and science than other career and technical education students. They earn higher GPAs as freshmen in college. And PLTW alumni are studying engineering and technology in greater numbers than the national average, with a higher retention rate in college engineering, science and related programs than non-PLTW students. As the nation's leading provider of rigorous and innovative STEM education, our vision is to ignite the spark of ingenuity, creativity and imagination within all students. By partnering with leaders in the classroom and in the boardroom, PLTW is preparing students to become the most innovative and productive in the world.

To find more information about Project Lead The Way and take the first steps on a pathway of imagination, innovation and learning, talk with your high school guidance counselor. Or go online and visit our website at [www.pltw.org](http://www.pltw.org).

# Engineering





The **PLTW Pathway To Engineering Program** is a curriculum that is designed to encompass all four years of high school. Foundation courses are supplemented by a number of electives to create eight rigorous, relevant, reality-based courses. **Activities are hands-on and project-based.** Students learn how to use the same industry-leading 3D design software that's used by companies like **Intel, Lockheed Martin and Pixar.** They explore aerodynamics, astronautics and space life sciences. **Hello, NASA.** They apply biological and engineering concepts related to biomechanics - **think robotics.** Students design, test, and actually construct circuits and devices such as **smart phones and tablets,** and work collaboratively on a culminating capstone project. Some PLTW students have even **received US patents.**

## Tier 1 - Foundation Courses

### Introduction to Engineering Design

# IED

In this course, students use 3D solid modeling design software to help them design solutions to solve proposed problems. Students will learn how to document their work and communicate solutions to peers and members of the professional community. This course is designed for 9th or 10th grade students. The major focus of the IED course is to expose students to the design process, research and analysis, teamwork, communication methods, global and human impacts, engineering standards and technical documentation.

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### Principles of Engineering

# POE

This survey course of engineering exposes students to some of the major concepts they'll encounter in a postsecondary engineering course of study. Students have an opportunity to investigate engineering and high-tech careers and to develop skills and understanding of course concepts. Students employ engineering and scientific concepts in the solution of engineering design problems. They develop problem-solving skills and apply their knowledge of research and design to create solutions to various challenges. Students also learn how to document their work and communicate their solutions to peers and members of the professional community. This course is designed for 10th or 11th grade students.

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### Digital Electronics

# DE

This course is the study of electronic circuits that are used to process and control digital signals. Digital electronics is the foundation of all modern electronic devices such as cellular phones, MP3 players, laptop computers, digital cameras and high-definition televisions. The major focus of the DE course is to expose students to the process of combinational and sequential logic design, teamwork, communication methods, engineering standards and technical documentation. This course is designed for 10th or 11th grade students.

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## Tier 2 - Specialization Courses

### Aerospace Engineering

# AE

The major focus of this course is to expose students to the world of aeronautics, flight and engineering through the fields of aeronautics, aerospace engineering and related areas of study. Lessons engage students in engineering design problems related to aerospace information systems, astronautics, rocketry, propulsion, the physics of space science, space life sciences, the biology of space science, principles of aeronautics, structures and materials, and systems engineering. Students work in teams utilizing hands-on activities, projects and problems and are exposed to various situations faced by aerospace engineers. In addition, students use 3D design software to help design solutions to proposed problems. Students design intelligent vehicles to learn about documenting their project, solving problems and communicating their solutions to their peers and members of the professional community. This course is designed for 11th or 12th grade students.

## Tier 2 - Specialization Courses (cont.)

### Biotechnical Engineering

# BE

The major focus of this course is to expose students to the diverse fields of biotechnology including biomedical engineering, molecular genetics, bioprocess engineering, and agricultural and environmental engineering. Lessons engage students in engineering design problems related to biomechanics, cardiovascular engineering, genetic engineering, agricultural biotechnology, tissue engineering, biomedical devices, forensics and bioethics. Students in this course apply biological and engineering concepts to design materials and processes that directly measure, repair, improve and extend living systems. The BE course is designed for 11th or 12th grade students.

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### Civil Engineering & Architecture

# CEA

The major focus of this course is completing long-term projects that involve the development of property sites. As students learn about various aspects of civil engineering and architecture, they apply what they learn to the design and development of a property. The course provides teachers and students freedom to develop the property as a simulation or for students to model the experiences that civil engineers and architects face. Students work in teams, exploring hands-on activities and projects to learn the characteristics of civil engineering and architecture. In addition, students use 3D design software to help them design solutions to solve major course projects. Students learn about documenting their project, solving problems and communicating their solutions to their peers and members of the professional community of civil engineering and architecture. This course is designed for 11th or 12th grade students.

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### Computer Integrated Manufacturing

# CIM

The major focus of this course is to answer questions such as: How are things made? What processes go into creating products? Is the process for making a water bottle the same as it is for a musical instrument? How do assembly lines work? How has automation changed the face of manufacturing? As students find the answers to these questions, they learn about the history of manufacturing, a sampling of manufacturing processes, robotics and automation. The course is built around several key concepts: computer modeling, Computer Numeric Control (CNC) equipment, Computer Aided Manufacturing (CAM) software, robotics and flexible manufacturing systems. This course is designed for 10th, 11th or 12th grade students.

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## Tier 3 - Capstone Course

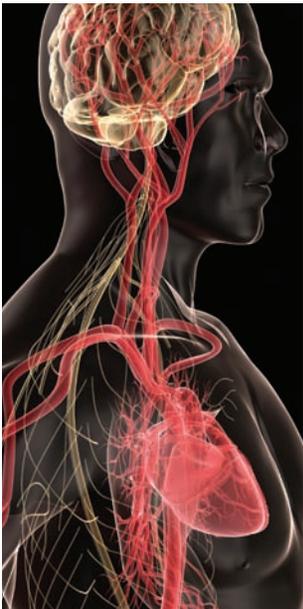
### Engineering Design & Development

# EDD

This capstone course allows students to design a solution to a technical problem of their choosing. They have the chance to eliminate one of the “Don’t you hate it when...” statements of the world. This is an engineering research course in which students will work in teams to research, design, test and construct a solution to an open-ended engineering problem. The product development life cycle and a design process are used to guide and help the team to reach a solution to the problem. The team presents and defends their solution to a panel of outside reviewers at the conclusion of the course. The EDD course allows students to apply all the skills and knowledge learned in previous Project Lead The Way courses. The use of 3D design software helps students design solutions to the problem their team has chosen. This course also engages students in time management and teamwork skills, a valuable set for students in the future. This course is designed for 12th grade students.

Biomedical





The **PLTW Biomedical Sciences Program** is a sequence of four courses which follows the PLTW Engineering Program's proven **hands-on, real-world problem-solving** approach to learning. Students explore the concepts of human medicine and are introduced to bioinformatics, including **mapping and analyzing DNA**. Through activities, like dissecting a heart, students examine the processes, structures and interactions of the human body - often playing the role of biomedical professionals to solve mysteries. **Think CSI meets ER**. They also explore the prevention, diagnosis and treatment of disease working collaboratively to investigate and design **innovative solutions** for the health challenges of the 21st century such as **fighting cancer with nanotechnology**.

## Principles of the Biomedical Sciences

# PBS

Students investigate the human body systems and various health conditions including heart disease, diabetes, sickle-cell disease, hypercholesterolemia and infectious diseases. They determine the factors that led to the death of a fictional person, and investigate lifestyle choices and medical treatments that might have prolonged the person's life. The activities and projects introduce students to human physiology, medicine, research processes and bioinformatics. Key biological concepts including homeostasis, metabolism, inheritance of traits and defense against disease are embedded in the curriculum. Engineering principles including the design process, feedback loops and the relationship of structure to function are also incorporated. This course is designed to provide an overview of all the courses in the Biomedical Sciences Program and lay the scientific foundation for subsequent courses.

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## Human Body Systems

# HBS

Students examine the interactions of body systems as they explore identity, communication, power, movement, protection and homeostasis. Students design experiments, investigate the structures and functions of the human body, and use data acquisition software to monitor body functions such as muscle movement, reflex and voluntary action, and respiration. Exploring science in action, students build organs and tissues on a skeletal manikin, work through interesting real-world cases and often play the role of biomedical professionals to solve medical mysteries.

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## Medical Interventions

# MI

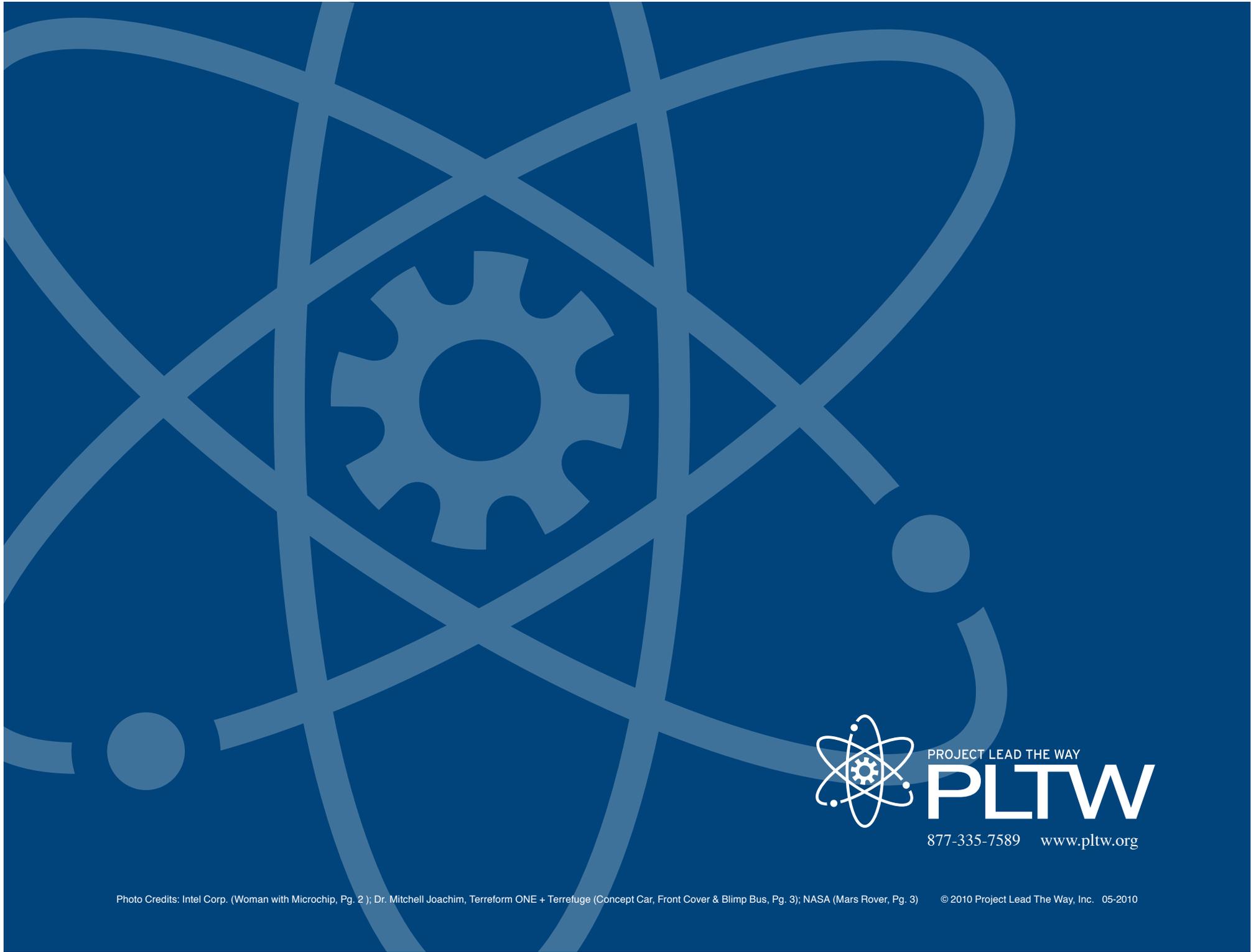
Students investigate a variety of interventions involved in the prevention, diagnosis and treatment of disease as they follow the lives of a fictitious family. The course is a "how-to" manual for maintaining overall health and homeostasis in the body as students explore how to prevent and fight infection; how to screen and evaluate the code in human DNA; how to prevent, diagnose and treat cancer; and how to prevail when the organs of the body begin to fail. These scenarios expose students to the wide range of interventions related to immunology, surgery, genetics, pharmacology, medical devices and diagnostics. Each family case scenario introduces multiple types of interventions and reinforces concepts learned in the previous two courses, as well as presenting new content. Interventions may range from simple diagnostic tests to treatment of complex diseases and disorders. These interventions are showcased across generations of a family and provide a look at the past, present and future of the biomedical sciences. Lifestyle choices and preventive measures are emphasized throughout the course as are the important roles scientific thinking and engineering design play in the development of interventions of the future.

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## Biomedical Innovation

# BI

In this capstone course, students apply their knowledge and skills to answer questions or solve problems related to the biomedical sciences. Students design innovative solutions for the health challenges of the 21st century as they work through progressively challenging open-ended problems, addressing topics such as clinical medicine, physiology, biomedical engineering and public health. They have the opportunity to work on an independent project and may work with a mentor or advisor from a university, hospital, physician's office, or industry. Throughout the course, students are expected to present their work to an adult audience that may include representatives from the local business and healthcare community.



PROJECT LEAD THE WAY

**PLTW**

877-335-7589 [www.pltw.org](http://www.pltw.org)