Integrative STEM

www.festo-didactic.com

Inspired by Nature

Engineering design-based learning

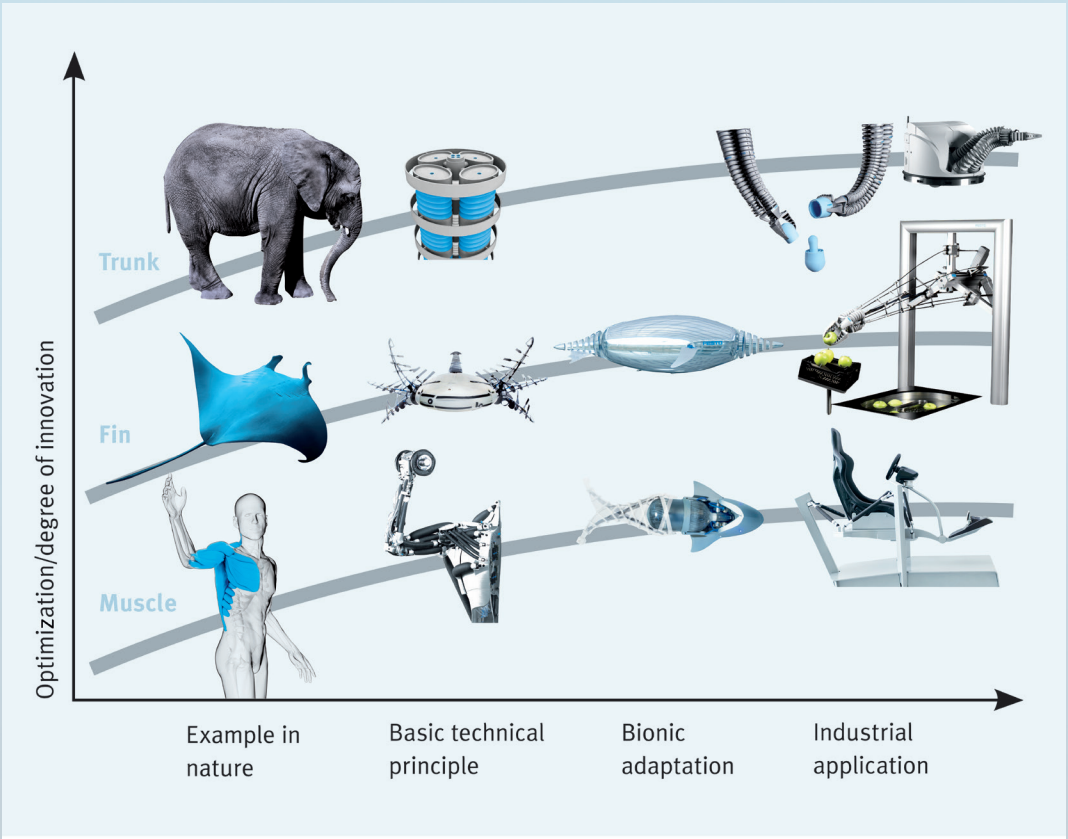
For billions of years, nature has successfully engineered natural, adaptive technologies for its survival. So it makes sense that nature has thus inspired human engineers to mimic many of its designs in order to solve complex problems and develop incredible technologies.

Festo Didactic recognizes that animals and insects make perfect engineers, solving many of the problems we struggle with today. So, our engineers take an innovative “bionic” approach, imitating elements of nature to seek solutions to the challenges facing our automated world.

A strong understanding of STEM is the backbone to the success of our bionic projects.

Our STEM program provides learners an opportunity to explore many technologies with a focus on engineering design-based learning, while integrating science and mathematics concepts using a project-based approach. In fact, inside this brochure is a template for a do-it-yourself fin gripper, as seen on the cover!

Our goal is to provide students the opportunity and inspiration to optimize solutions for real-world problems where they learn concepts related to STEM disciplines in a hands-on, “learn-by-doing” environment. Festo Didactic’s STEM program seeks to motivate and inspire the next generation of problem solvers.



Biomechatronic footprint: from nature to industrial applications

Integrative STEM Education

Making the connections in secondary education

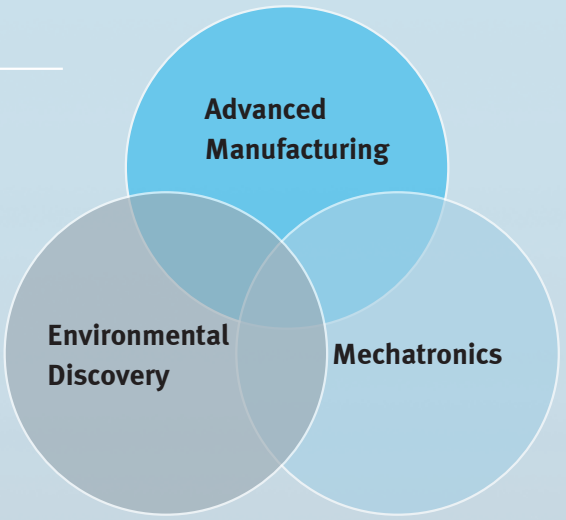
Integrative STEM education is about intentionally combining math and science concepts with technology and engineering skills to solve problems. Students who engage in integrative STEM projects in order to solve authentic problems develop communication and collaboration skills, as well as sustained interest in STEM disciplines and increased competency levels.

Festo offers a turn-key solution for implementation of high school STEM programs that incorporates the problem-based learning environments schools need. Each course in our STEM solution allows students the opportunity to explore real-world problems, reflect on the problem solving process, develop design solutions, and solve problems in science, technology, engineering, and math fields. Our integrated approach to STEM emphasizes innovation, problem-solving, critical thinking, and creativity using hands-on training systems, enabling students to complete projects using the engineering design process while integrating the concepts related to STEM disciplines in a “learning-by-doing” environment.

Our integrative STEM solution, which offers a number of technologies and emerging technologies, is flexible and allows for a STEM classroom to consist of an entire lab with modules from all clusters, specific clusters, or a variety of each.

Mission-driven learning
- EML (entrepreneurially-minded learning)

Backward Design
- Desired results
- Evidence
- Learning plan



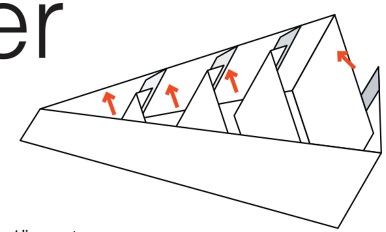
Traditional learning
- SBL (Subject-based learning}

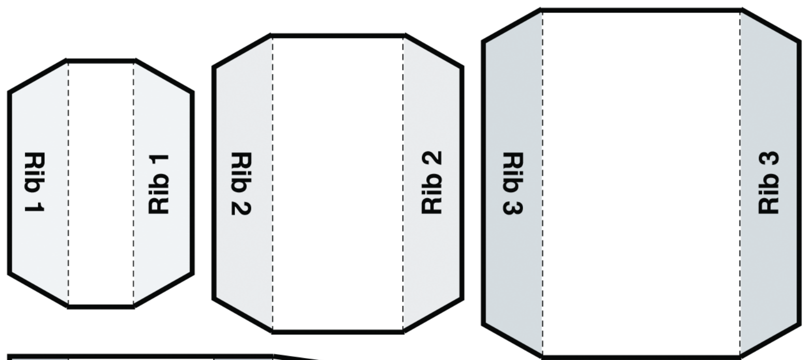
Inductive learning
- CBL (collaborative/scenario-based learning)
- PBL (problem-based learning)

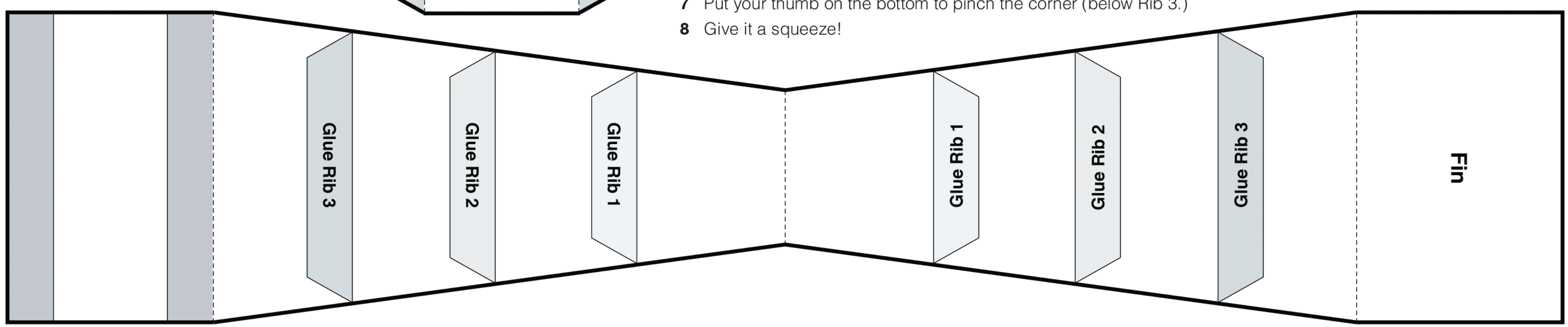
STEM

Festo Fin Gripper

1 If this is not on cardstock, glue the whole pattern on construction paper.
2 Cut out the four individual pieces.
3 Fold the ribs and the fin along the dotted lines.
4 Apply glue to the gray areas of the fin.
5 Glue each matching rib in place. For example, “Rib 1” on both “Glue Rib 1” spots.
6 Join the bottom of the fin together as shown in the picture, right.
7 Put your thumb on the bottom to pinch the corner (below Rib 3.)
8 Give it a squeeze!







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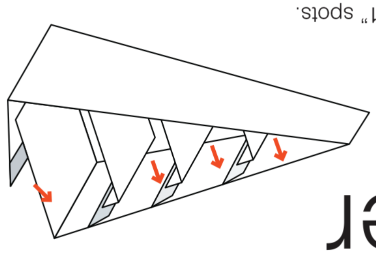
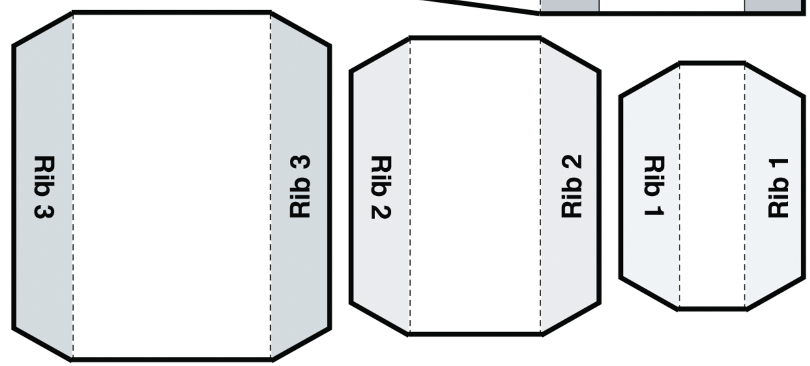
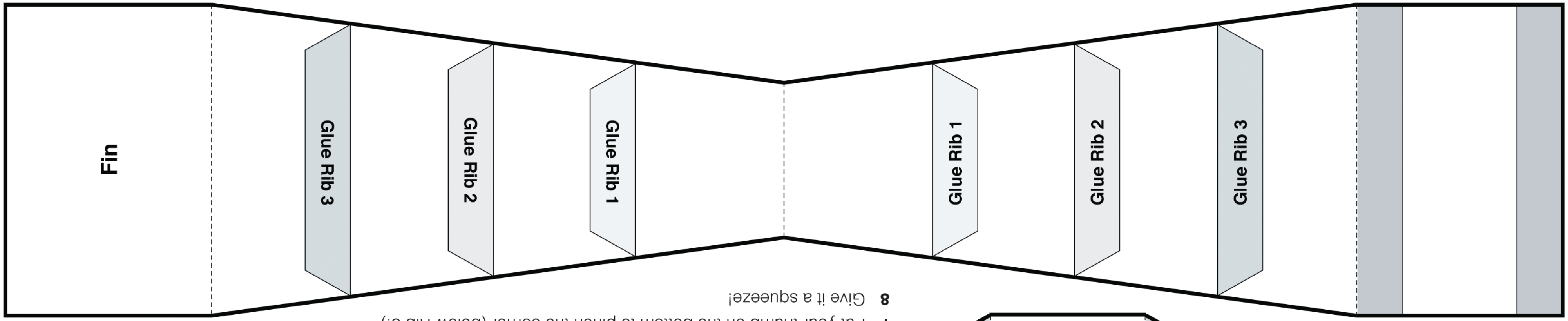






Engineering and Stress Analysis

Students act as civil engineers, challenged with the design and construction of a new bridge prototype, exploring in the process the basics of statics and stress analysis. Students also investigate the considerations engineers take into account before designing structures.

Plastics

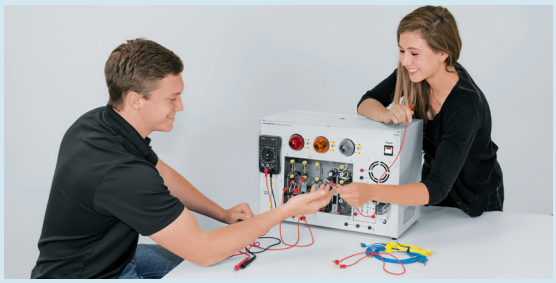
Students explore plastics through chemistry and materials science, conducting chemical reaction experiments and using various molding processes to form different types of plastics. Students ultimately apply their knowledge to product design.

Exploring Mechanisms

After exploring mechanical power and different types of machines, and acquiring a foundation in mechanical basics through hands-on work, students develop solutions for real-life applications of the machines.

Exploring Electronics

Students are challenged to build the electronic circuits required to solve typical electrical problems that may be encountered by electronics engineers. As they design new circuits for innovative electronics products, they will gain basic knowledge required for electronics engineers.



Exploring Electricity

Students are challenged to design electric circuits to solve typical residential and commercial electrical problems. Exploring and practicing as they safely work with electricity, they will gain some basic knowledge required to work in the field or to become electrical engineers.

CNC Lathe

Exploration into subtractive manufacturing using a CNC lathe challenges students to develop prototypes and produce parts, adhering to certain specifications and constraints to design and export 3D models for the prototype production process.

Aerodynamics

As Aeronautical Design Engineers, students design and build an airfoil prototype for the wings of an airplane, performing various activities to verify aerodynamics principles presented along the course using a wind tunnel.

Computer-Aided Design with 3D Printing

As CAD designers tasked with creating innovative product designs, students are challenged to develop ideas within certain specifications and constraints, and apply CAD software tools to translate their ideas into new product designs.

Automation and Robotics

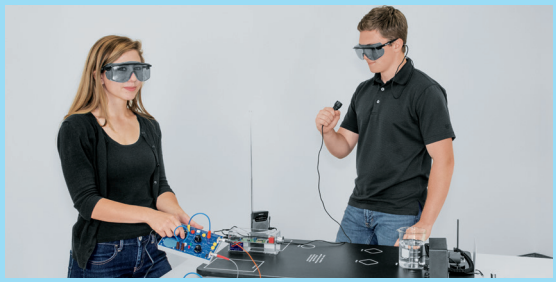
Students explore robotics systems and the role they play in industry, actively designing a complete robotics system with a robot arm and peripheral tools to simulate manufacturing processes.

Exploring Mechatronics

Students, taking on the role of mechatronics engineers, are challenged to design an automated system that adheres to given specifications and constraints, and explore the interaction between mechanics, electrical engineering, electronics, and computer engineering.

CNC Mill

Exploration into subtractive manufacturing using a CNC mill challenges students to develop prototypes and produce parts, adhering to certain specifications and constraints to design and export 3D models for the prototype production process.



Fiber Optics and Lasers

Students are challenged to design, build, and demonstrate a two-segment (optical fiber and over-the-air laser links), end-to-end circuit, including the specification of the equipment required at the interface between the two segments and at both terminals.

Introduction to Process Engineering

As Process Control Engineers, students learn to read and draw schematics, mechanical drawings, and flow diagrams, as well as the hardware, software, and various sensors required for automated control, learning in the process how automatic control systems impact daily life.

Alternative Energy

By exploring solar power, wind power, and geothermal energy through hands-on activities, students focus on renewable energy sources and how they can be identified, measured, collected, and used.

Environmental Technology – Water

As environmental protection professionals, students explore water testing and water treatment methods, and the impact they can have on the environment. Within a given scenario, students develop a clean water solution for both humans and wildlife.

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