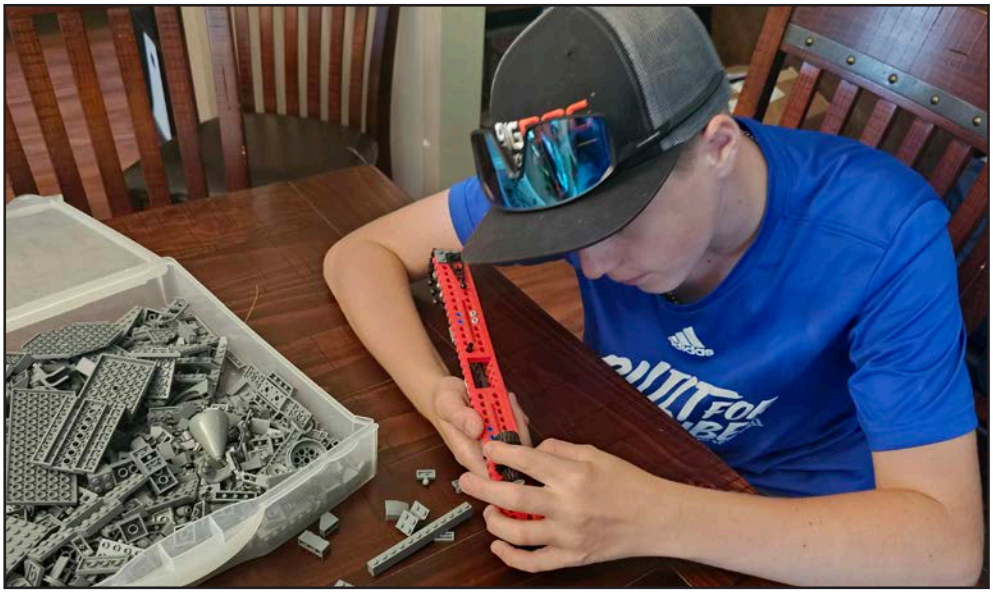
K-STATE Research and Extension

Explore Your Spark!

Building Block Engineering



The Building Block Engineering project combines physics, engineering, creativity, and hands-on discovery to help youth become innovative problem-solvers. Using building blocks such as LEGO®, participants explore the fundamentals of engineering, design, and construction. Through the building process, youth learn how structures work, how forces interact, and how thoughtful design leads to strong and functional creations. From constructing simple models to designing detailed dioramas, participants learn to think critically, experiment with solutions, and express their creativity through imaginative builds. This project helps youth strengthen spatial reasoning, planning, and skills that prepare them to be Beyond Ready for future learning, careers, and real-world challenges.

Starting Out
Beginner:

- Explore your creativity by experimenting with different shapes, colors, and designs.
- Learn basic engineering ideas such as balance, stability, and simple structures.
- Practice following simple building instructions and creating your own basic models.
- Develop spatial reasoning by identifying how pieces fit together.
- Discover how everyday objects use basic engineering concepts.

Learning More
Intermediate:

- Apply principles like symmetry, patterns, and weight distribution in your builds.
- Construct more complex structures such as bridges, towers, and moving models.
- Use diagrams or simple blueprints to plan your creations before building.
- Explore architectural concepts by creating buildings with multiple levels or functions.
- Practice presenting and explaining your designs to others.

Expanding Horizons
Advanced:

- Design and build advanced models that include mechanical movement, gears, or functional components.
- Experiment with engineering challenges (load-bearing strength, angles, and force).
- Use the engineering design process of plan, build, test, evaluate, and improve to guide your projects.
- Create detailed architectural dioramas or scaled structures based on real-world buildings.

Beyond Ready

Ready to Lead

Youth involved in 4-H are **two times more likely to have the goal of becoming a leader.** Through real-world experiences and the guidance of caring mentors, they develop the confidence, communication, and decision-making skills needed to lead in today's changing world.

Ready to Serve

Youth who participate in 4-H are **three times more likely to engage in community service.** Service learning provides them with purpose and connection at a time when **more than 53% of Gen Z report feeling lonely.** Through 4-H, youth are empowered to serve with compassion and make a meaningful impact.

Ready to Build

With nearly **10 million unfilled jobs and 77% of employers seeking real-world skills,** 4-H helps youth build what matters. Through hands-on projects and career exploration, youth gain adaptability, problem-solving, and workforce readiness.

Ready to Conquer

While 52% of young people feel like they're failing at life goals, 4-H youth rise with resilience. Backed by research and supported by caring adults, they learn to overcome challenges, set goals, and take charge of their future with confidence.

Building a Ready Generation in a World of Change!

Building Block Engineering

Expand Your Experiences!

Healthy Living:

- Strengthen fine motor skills and hand-eye coordination.
- Boost confidence by completing builds and solving engineering problems.
- Learn how creating and designing can support emotional well-being.
- Develop planning and organization skills that support healthy habits in daily life.

Science and Agriculture:

- Investigate how simple machines (gears, levers, pulleys) work in mechanical builds.
- Analyze how changing materials, shapes, or supports affects structural strength.
- Build scale models of agricultural structures and equipment.
- Explore physics concepts in your builds (gravity, force, balance, load distribution).

Community Vitality:

- Create models of important community structures (schools, parks, community centers).
- Share your engineering knowledge at a library youth program.
- Work with local leaders to design models to help solve a community challenge.
- Display your work at libraries or community events.

Communication and the Arts:

- Produce a video or slideshow showcasing your project from start to finish.
- Write and share a story featuring characters or scenes built from your building blocks.
- Create posters explaining your design process and engineering choices.
- Design architectural artwork or themed dioramas using building blocks.

Career Exploration:

- Explore how professionals use models in their work.
- Job shadow an architect, engineer, construction manager, or CAD technician.
- Interview professionals who use 3D modeling.
- Tour a construction site.
- Visit a local makerspace.
- Visit a college or technical school.
- Explore careers in construction and engineering.
- Create a real/conceptual product or service business and participate in a YEC (Youth Entrepreneurship Challenge) competition.
- Explore cybersecurity jobs in construction and engineering careers.

Contact Information

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Resources & Events:

- Share what you have learned at a Club Day presentation.
- Kansas 4-H Discovery Days.
- Summer Day Camp building block challenges.
- Join a school or community engineering club or design challenge.
- Participate in bridge-building, tower design, or innovation challenges.
- Display your structures or dioramas at a local library.

Curriculum & Resources:

- Contact your local Extension office.
- Go to Kansas 4-H Project Website — https://www.kansas4-h.org/projects/engineering-technology/building-block-engineering/
- Building Blocks Engineering Project — https://www.kansas4-h.org/projects/engineering-technology/building-block-engineering/docs/Building%20Blocks%20Manual.pdf
- Explore online building block educational resources for engineering and design challenges.

4-H Record Keeping:

Learning to keep accurate records is a life skill.

- Setting 4-H Project Goals (4H1100), https://bookstore.ksre.ksu.edu/download/setting-4-h-project-goals_4H1100
- Kansas 4-H Record Keeping, https://www.kansas4-h.org/resources/awards-and-recognition/LocalRecordKeeping.html
- Track the following in a journal:
  - Plans, sketches, and project diagrams.
  - Build photos (include redesigns/improvements).
  - Challenges and solutions for engineering design process.

Project Exhibit Ideas:

- Construct a diorama or scale model of an item.
- Build a functional structure (bridge, tower, vehicle, crane, etc.).
- Create a notebook with blueprints, sketches, photos.
- Create a poster showing your design process.
- Build a mechanical model using gears, levers, simple machines.

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Kansas State University Cooperative Extension Service
Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Director of Extension, Kansas State University, County Extension Councils, Extension Districts. Kansas State University is an equal opportunity provider and employer. 4H1177 January 2026