CURRICULUM GUIDE

STEM SCOUTS®

SCIENCE
TECHNOLOGY
ENGINEERING
MATH

SCOUT LAW

A Scout is trustworthy, loyal, helpful, friendly, courteous, kind, obedient, cheerful, thrifty, brave, clean, and reverent.

SCOUT OATH

On my honor, I will do my best To do my duty to God and my Country and to obey the Scout Law; To help other people at all times; To keep myself physically strong, mentally awake, and morally straight.

GROW NEW SKILLS

STEM Labs are a chance to be creative; develop leadership, problem-solving, teamwork and communications skills; and learn to think like a STEM professional.

LEARN BY DOING

See how real companies use hands-on experiments, like those in STEM Labs, to invent new technologies, medicines and ideas that change lives.

PREPARE FOR THE FUTURE

Mentors, research skills and the opportunity to publish in a peer-reviewed journal increase chances for college scholarships.

BUILD A CAREER

See how real people in real companies use experiments like the ones you do in STEM Scouts to invent the future.

SHAPE. TINKER. EXPLORE. MAKE. THAT'S WHAT STEM SCOUTS DO AS THEY OPEN THEIR EYES TO THE WONDERS OF SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS.

STEM Scouts is a national pilot program from the Boy Scouts of America (BSA), focused on fun ways for girls and boys, grades 3 - 12, to learn more about STEM subjects. Hands-on activities and interaction with STEM professionals stir up Scouts' interest in the world around them.

Weekly meetings and monthly field trips use the Scouts' natural curiosity to help build interest in STEM-related subjects and careers. Scouts rotate through different roles within the group to learn leadership and cooperation. Incorporating the Scout Oath and Laws provides an opportunity to teach character development as well as STEM subjects.

The curriculum, designed and vetted by STEM educators, unfolds in modules that each address a single topic, such as chemistry or gravity, over several meetings. Elementary Scouts work through a series of four-week modules, while middle and high school Scouts explore subjects in six-week modules.

The depth and detail of information increases as Scouts move from one age group to the next. When STEM Scouts reach high school, they have the opportunity to work with mentors and even publish their work in a peer-reviewed journal.

In many areas, a mobile STEM Lab, the Vortex, provides opportunities for learning on the go.

MEETING STRUCTURE

PLEDGE OF ALLEGIANCE

SCOUT OATH AND LAW

Discuss one of the 12 points of the Scout Law and how it applies to the Scouts' activities that day.

Applying the Scout Oath and Law

With the leader's guidance, the Scouts discuss a problem or ethical situation that occurred in that day's meeting and how they can apply the Oath and Law to dealing with everyday issues.

ACTIVITY NARRATIVE

The Lab Manager tells a story that sets the background information and lays out the challenge to be addressed in that day's Lab.

EXPERIENTIAL ACTIVITIES

Step 1: State the Challenge

Scouts restate the challenge by writing it in their Lab books. They break into small groups to work, and the Lab Manager assigns roles of Principal Investigator (PI), Co-PI, Project Manager and Technicians, who perform the hands-on experiments.

The Manager reviews the Engaging Questions to start the Scouts thinking about the challenge and how to solve it. For example:

How does a parachute work? Does a bigger parachute have more air resistance? Does the amount of drag force affect how well the parachute works? Does string length make a difference? Does shape matter?

Step 2: Design and Experiment

Scouts work together in small groups to design and plan. Scouts present drawings and plans for the leader's approval and, if approved, begin to build or prepare for their experiments.

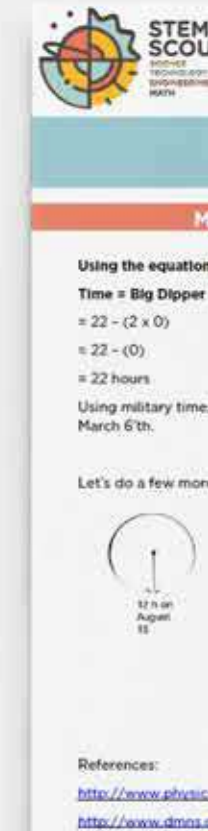
Step 3: Test and Redesign

After testing their designs and conducting their experiments, Scouts record observations and measurements in their Lab notebooks.

EVALUATION: Scouts review a set of discussion questions to evaluate their work and decide whether they can make improvements. They can continue making improvements and retesting until they are satisfied with their solution.

STEM INNOVATORS DISCUSSION

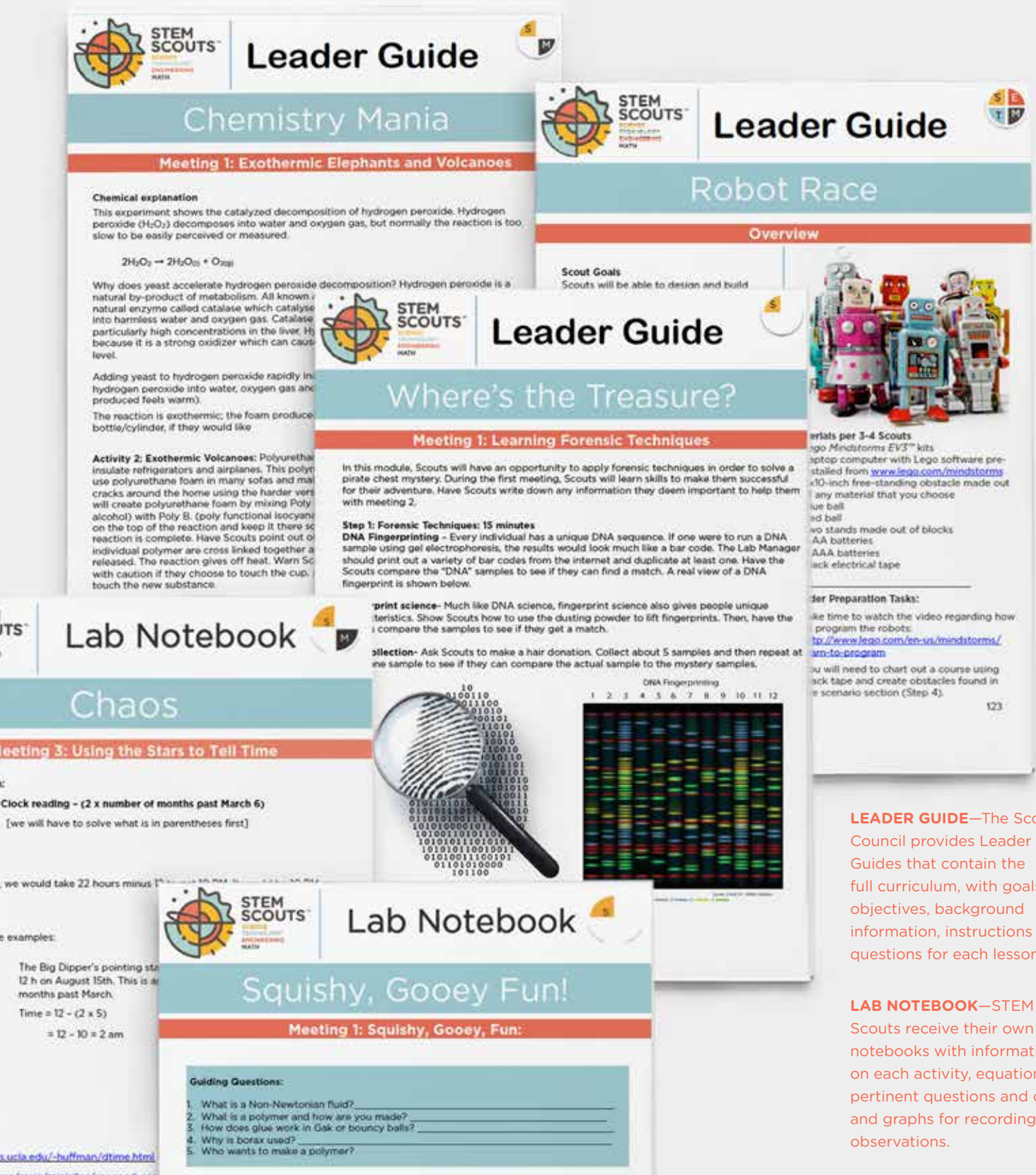
The Lab Manager or youth talks to Scouts about an innovator in a STEM field to demonstrate to the youth that people of their same ethnic background, race, and socioeconomic status can become accomplished STEM professionals. They discuss the person's life and work.



LESSON PLANS

STEM Scouts relies on Chartered Organizations, such as corporations, private schools, civic groups and religious organizations and to provide support and volunteer leaders for STEM Scout Labs. The STEM Scouts office provides direction and assistance in recruiting both adult volunteers and Scouts. The Scout Council provides all of the materials and training needed for Lab leaders and volunteers.

Costs are $200 per year for students, $50 per year for adult registration and $40 per year for liability insurance for the Chartered Organization.



LEADER GUIDE—The Scout Council provides Leader Guides that contain the full curriculum, with goals, objectives, background information, instructions and questions for each lesson.

LAB NOTEBOOK—STEM Scouts receive their own Lab notebooks with information on each activity, equations, pertinent questions and charts and graphs for recording observations.


USA
USA


STEM SCOUTS™
SCIENCE
TECHNOLOGY
ENGINEERING
MATH


200 mL
±5%
150
100
50

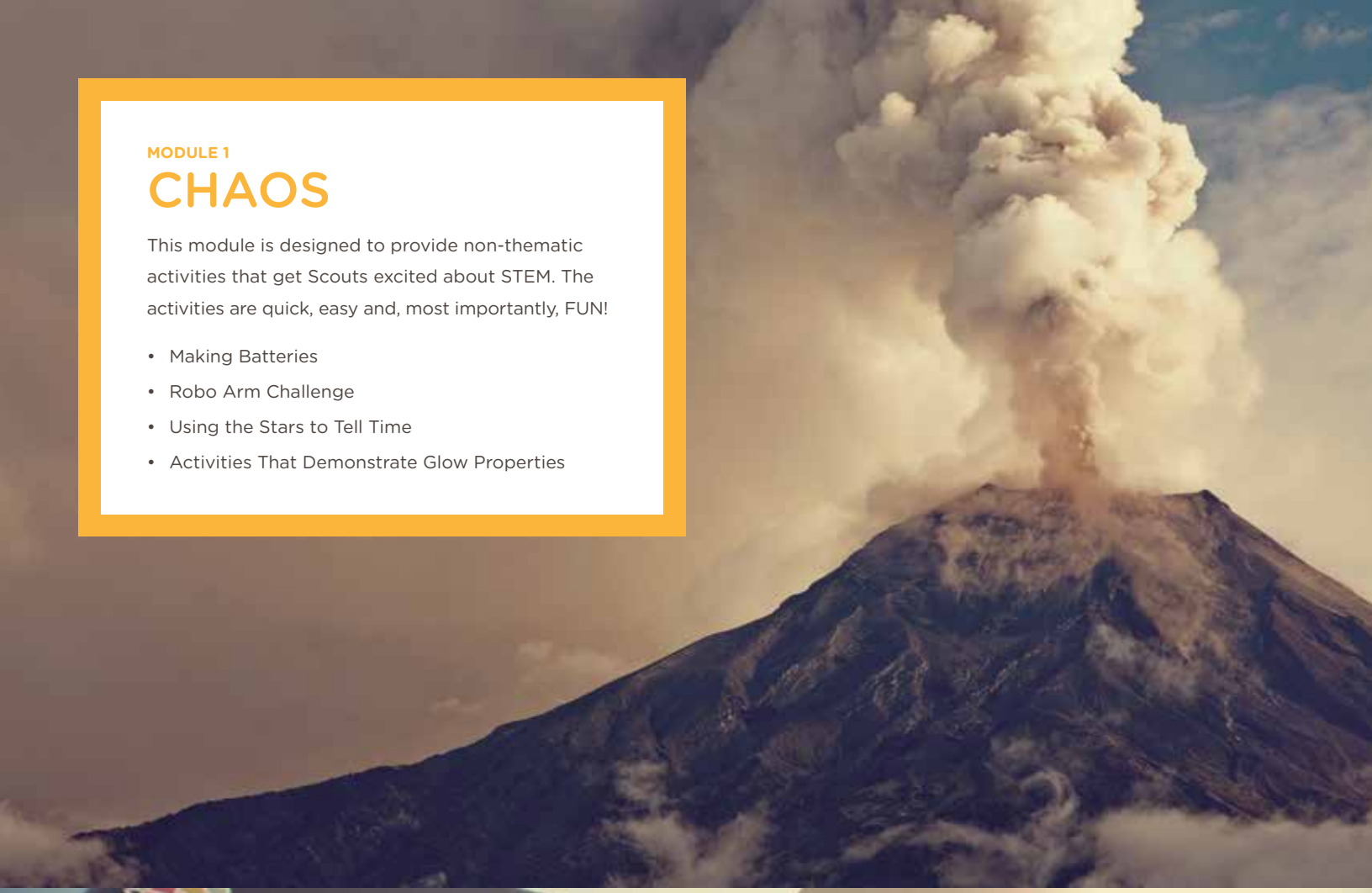
ELEMENTARY SCHOOL

GRADES 3-5

Elementary level STEM Scouts learn to be creative doing experiments in weekly Lab meetings, take field trips and work with people in STEM careers. They try new things as they work with others, lead teams and communicate results. STEM Scouts explore exciting STEM-related topics, each grouped into a four-week series of lessons.

STEM Scout's learning modules are designed and vetted by STEM educators and professionals to be fun and age-appropriate. Hands-on activities help students learn the academic concepts behind the experiments. Elementary-age STEM Scouts have the opportunity to earn participation awards for their weekly activities.

While the specific curriculum may change from year to year and vary somewhat by council, the following examples are typical of the modules available for each age group.

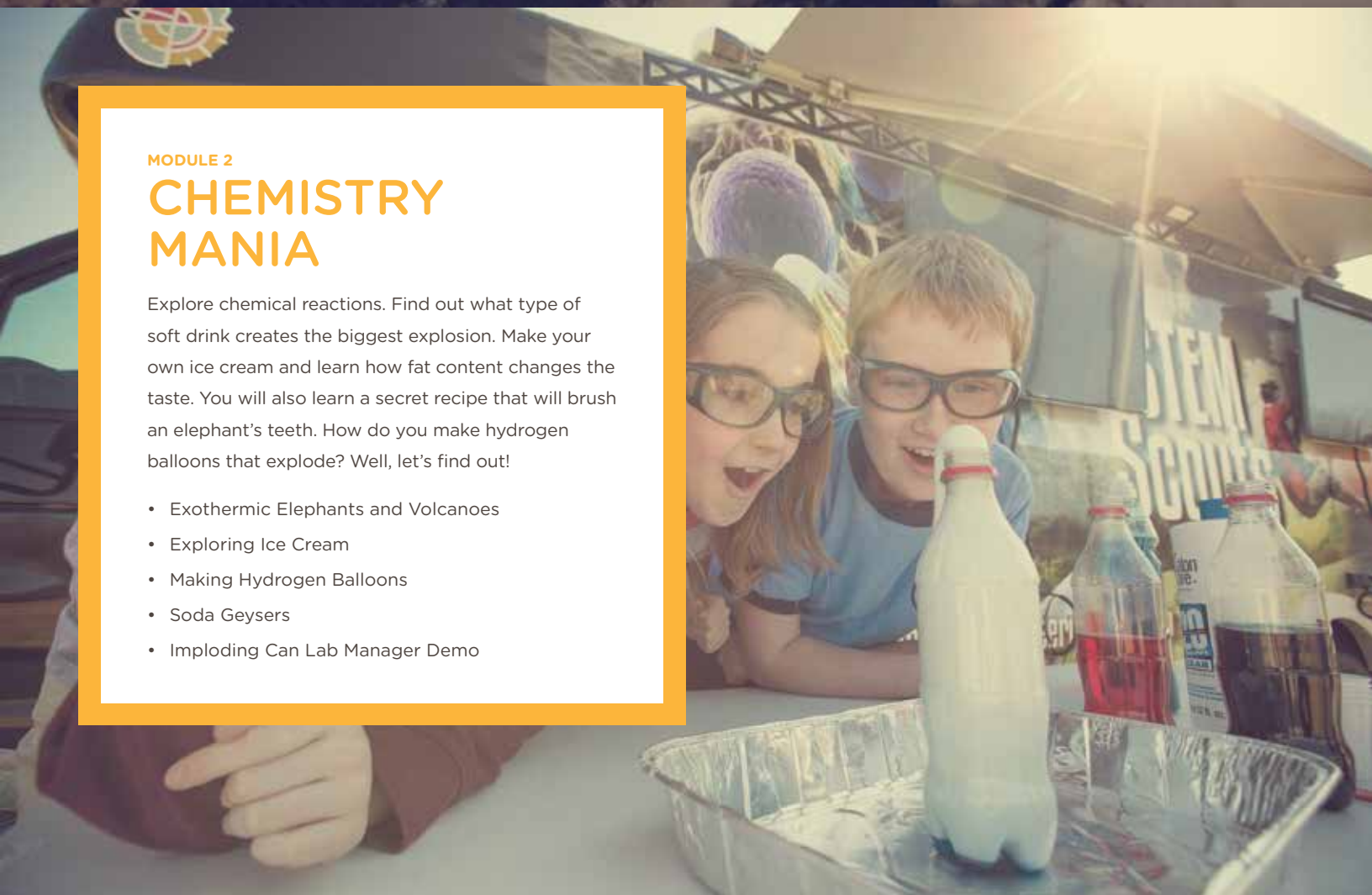


MODULE 1

CHAOS

This module is designed to provide non-thematic activities that get Scouts excited about STEM. The activities are quick, easy and, most importantly, FUN!

- Making Batteries
- Robo Arm Challenge
- Using the Stars to Tell Time
- Activities That Demonstrate Glow Properties



MODULE 2

CHEMISTRY MANIA

Explore chemical reactions. Find out what type of soft drink creates the biggest explosion. Make your own ice cream and learn how fat content changes the taste. You will also learn a secret recipe that will brush an elephant's teeth. How do you make hydrogen balloons that explode? Well, let's find out!

- Exothermic Elephants and Volcanoes
- Exploring Ice Cream
- Making Hydrogen Balloons
- Soda Geysers
- Imploding Can Lab Manager Demo

MODULE 3

MAD ABOUT GRAVITY

How does gravity work? Learn how a parachute slows down a falling egg. Create a real-life Angry Birds™ game, participate in an egg drop challenge and launch your own designed rocket.

- Designing a Parachute
- Egg Drop Challenge
- Designing Alka-Seltzer® Rockets
- Designing a Real Life Angry Birds™ Game

MODULE 4

SQUISHY, GOOEY FUN!

In this module, scouts will investigate how to make bouncing balls and use different ratios of the same materials to make different substances. Scouts will also take a look at strawberry DNA and make an American flag out of squishy circuits. Everything ooey gooey!

- Sponge relay race, making slime, Gak and bouncy balls
- Strawberry DNA extraction
- Making insulating and conductive dough
- Putting squishy circuits together

Try new things, lead teams and communicate results

Hands-on activities, weekly meetings, monthly field trips, interaction with STEM professionals

MIDDLE SCHOOL

GRADES 6-8

Middle school students dive deeper into STEM topics. They learn to be creative, work with others and try new things, all while taking field trips and working with people in STEM careers. STEM Scouts meet in weekly Labs to explore exciting STEM-related topics, each grouped into six-week series of lessons called modules.

STEM Scout's learning modules are designed and vetted by STEM educators and professionals to be fun and age-appropriate. Hands-on activities help students learn the academic concepts behind the experiments. They can also earn participation and achievement awards.

While the specific curriculum may change from year to year and vary somewhat by council, the following examples are typical of the modules available for each age group.

MODULE 1

CHAOS

Try a different STEM project every day. Learn about different topics, such as smoke bombs, electrical circuits, electromagnets, 3D modeling, stop-motion animation.

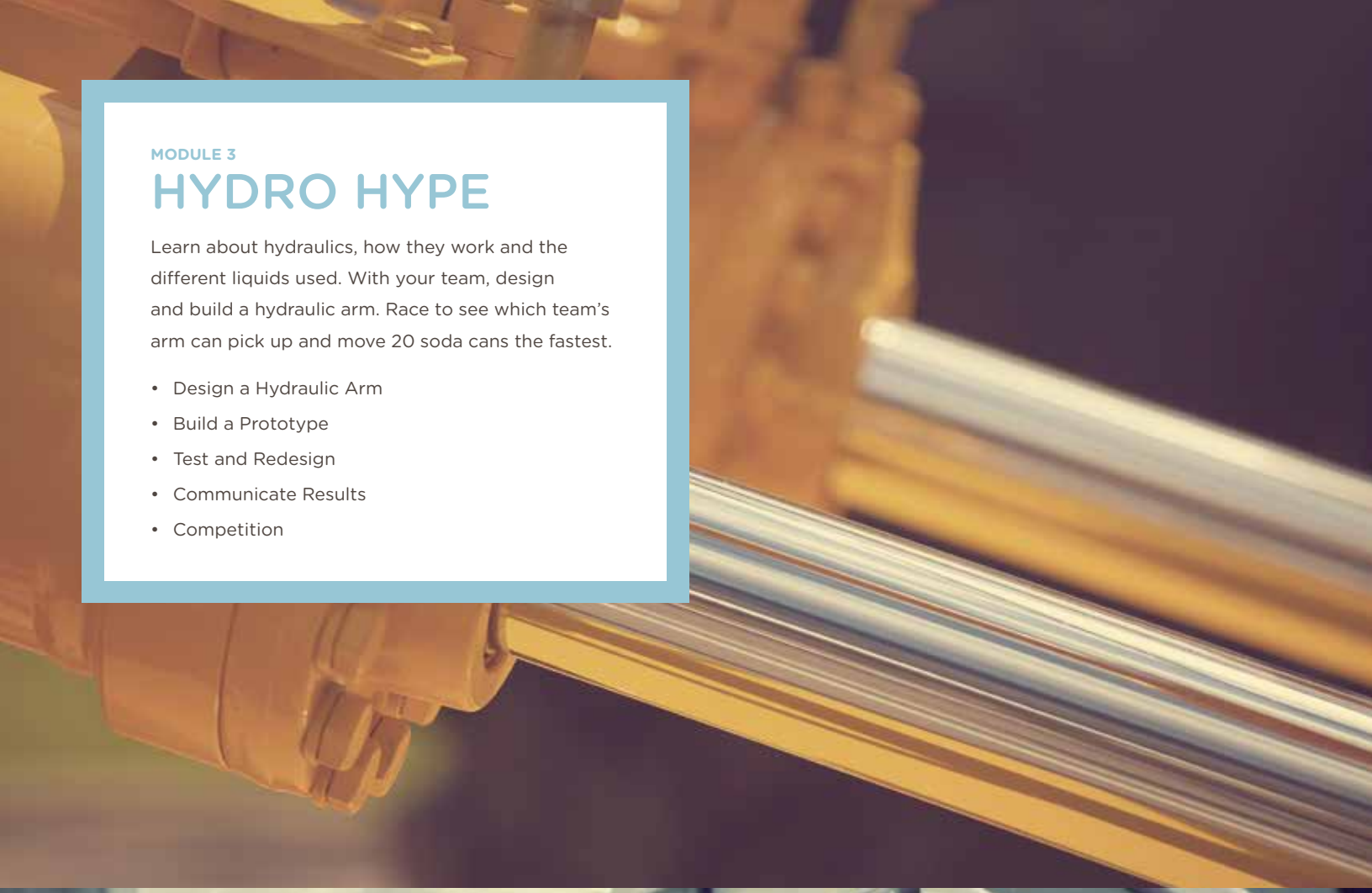
- Bungee Jumping
- Curious Creatures
- Electromagnetic Challenge
- Flour Darts
- Stop Motion Animation
- Paintball Potion

MODULE 2

CHEMISTRY MANIA

Explore chemical reactions—and make some explosions. What soft drink makes the biggest boom? Use chemistry to make your own ice cream. Learn a secret recipe for brushing an elephant's teeth. How do you make exploding hydrogen balloons? It's time to find out!

- Exothermic Elephants and Volcanoes
- Exploring Ice Cream
- Making Hydrogen Balloons
- Soda Geyser Reactions
- It's a Gas!
- Investigating Spectra

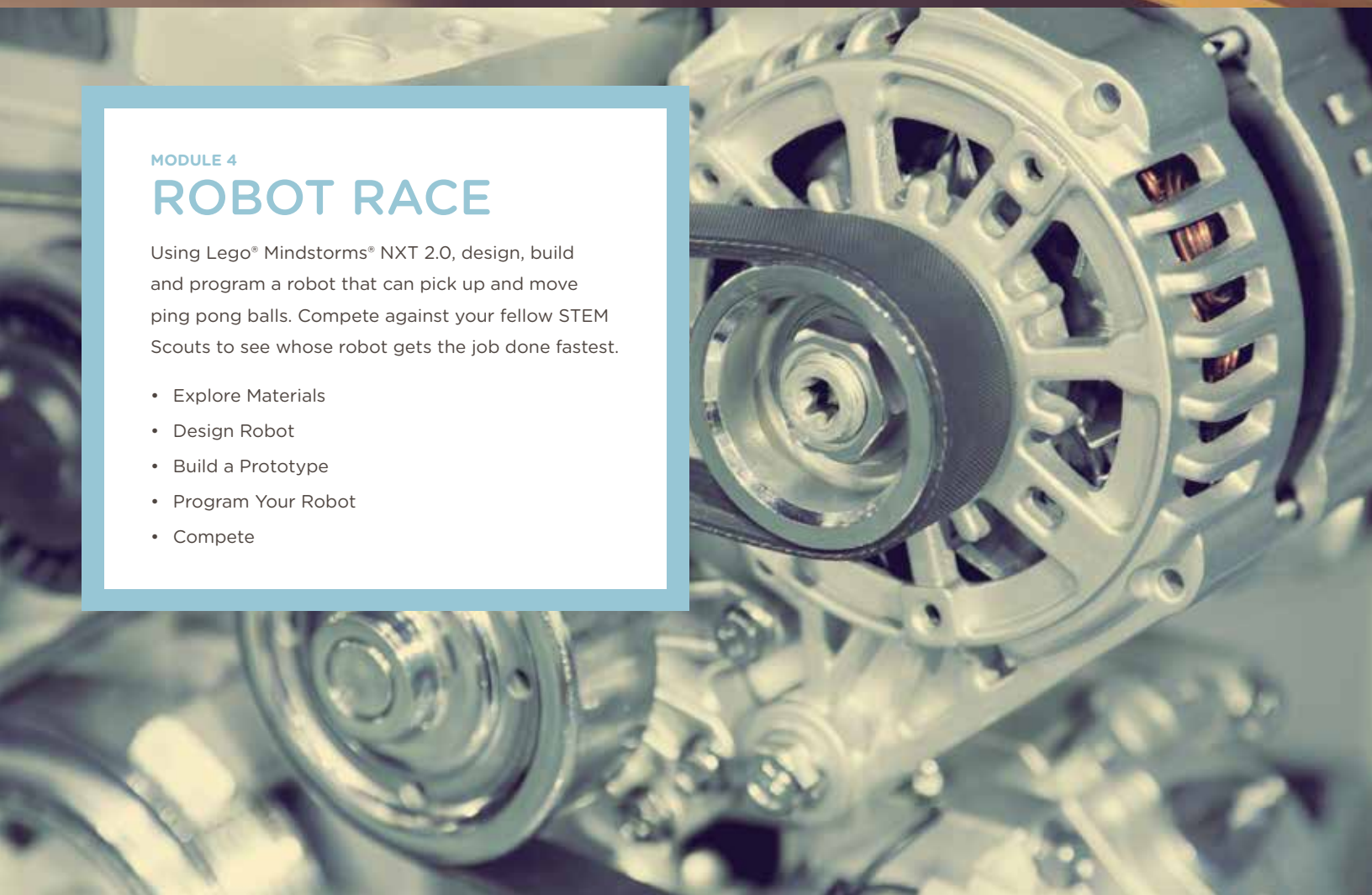


MODULE 3

HYDRO HYPE

Learn about hydraulics, how they work and the different liquids used. With your team, design and build a hydraulic arm. Race to see which team's arm can pick up and move 20 soda cans the fastest.

- Design a Hydraulic Arm
- Build a Prototype
- Test and Redesign
- Communicate Results
- Competition



MODULE 4

ROBOT RACE

Using Lego® Mindstorms® NXT 2.0, design, build and program a robot that can pick up and move ping pong balls. Compete against your fellow STEM Scouts to see whose robot gets the job done fastest.

- Explore Materials
- Design Robot
- Build a Prototype
- Program Your Robot
- Compete

MODULE 5

WHERE'S THE TREASURE

ILM

SUSTAINABLE PAPER

ILM

VERTICAL FARMING

Earn electronic badges for completing achievements

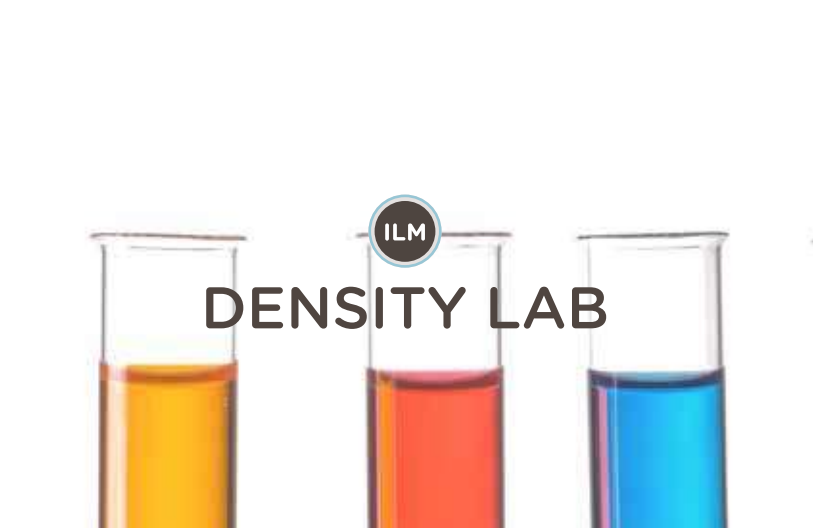
Learn leadership, teamwork and communications skills

ILM

GRAPHING LAB

ILM

UNIT CONVERSION



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DENSITY LAB

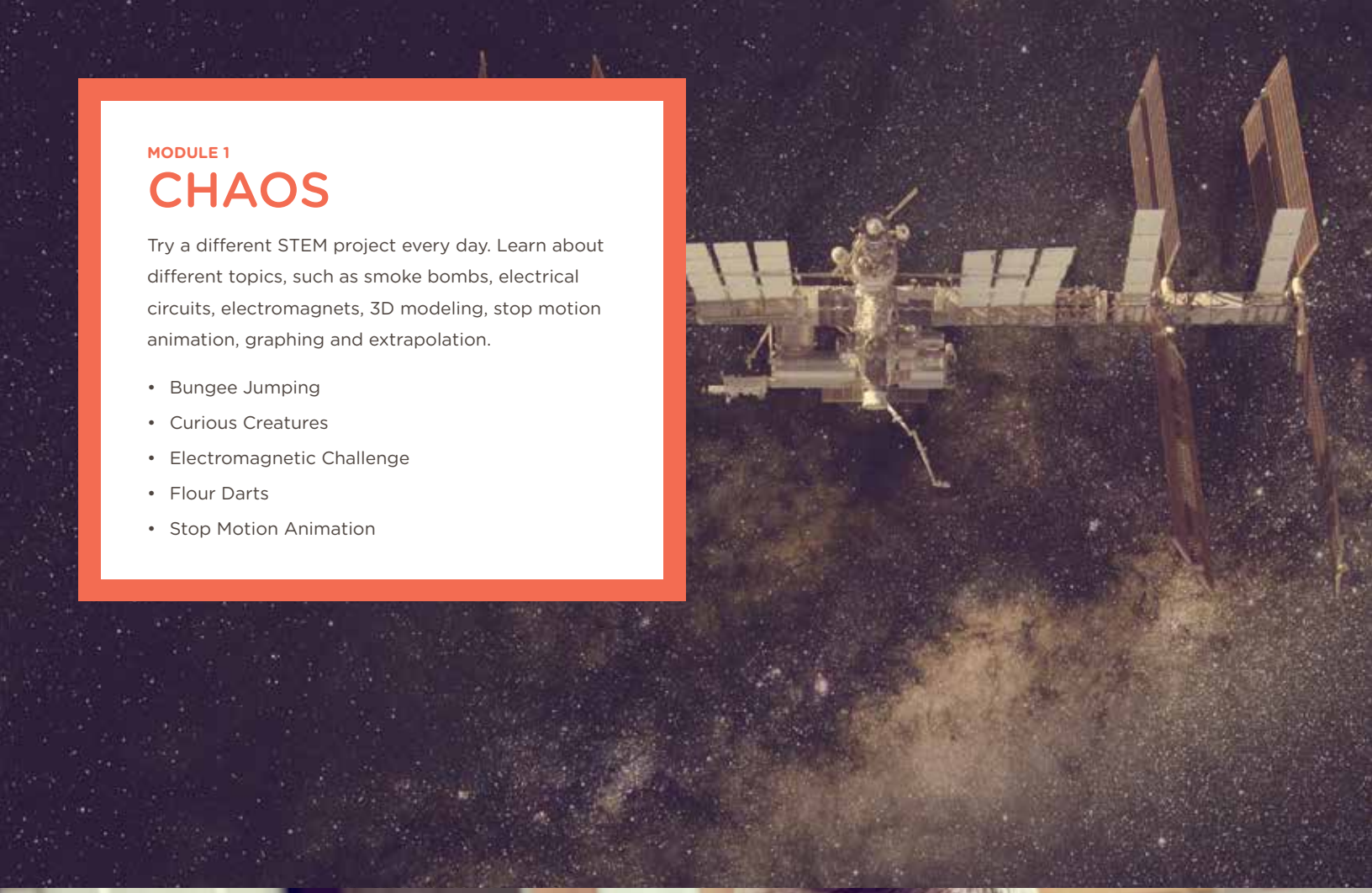
HIGH SCHOOL

GRADES 9-12

High school students take their study of STEM topics to a higher level as they learn through hands-on experiments, field trips and independent study. STEM Scouts meet in weekly labs to explore different STEM-related topics, each grouped in six-week learning modules.

High school STEM Scouts can earn virtual badges and achievement awards as they complete modules and independent study projects. They can expand their study of topics of interest through Individual Learning Modules. With STEM professionals as mentors and the opportunity to publish their work in an online, peer-reviewed journal, high school STEM Scouts can give themselves an advantage in college applications and scholarship searches.

While the specific curriculum may change from year to year and vary somewhat by council, the following examples are typical of the modules available for each age group.

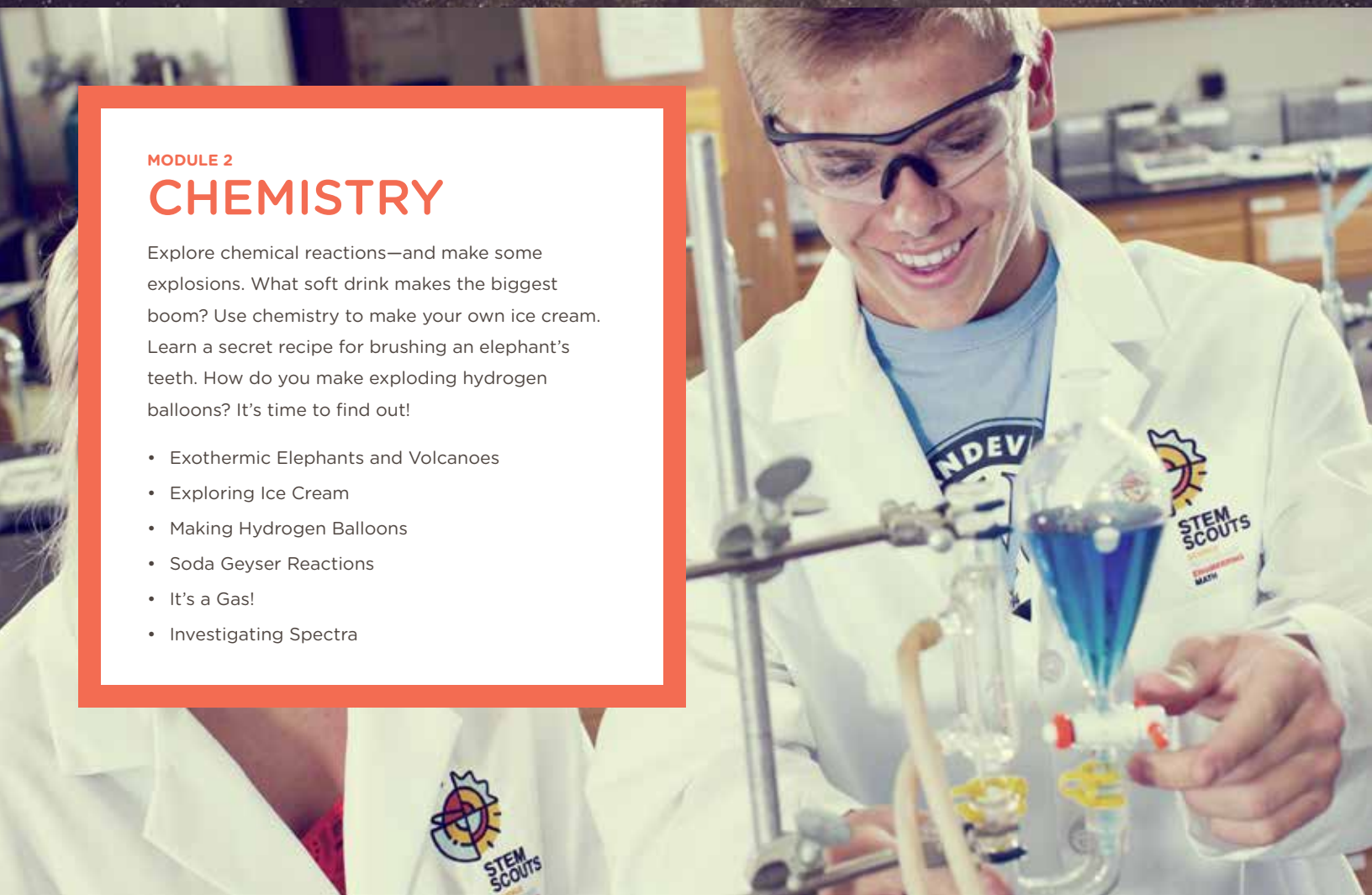


MODULE 1

CHAOS

Try a different STEM project every day. Learn about different topics, such as smoke bombs, electrical circuits, electromagnets, 3D modeling, stop motion animation, graphing and extrapolation.

- Bungee Jumping
- Curious Creatures
- Electromagnetic Challenge
- Flour Darts
- Stop Motion Animation

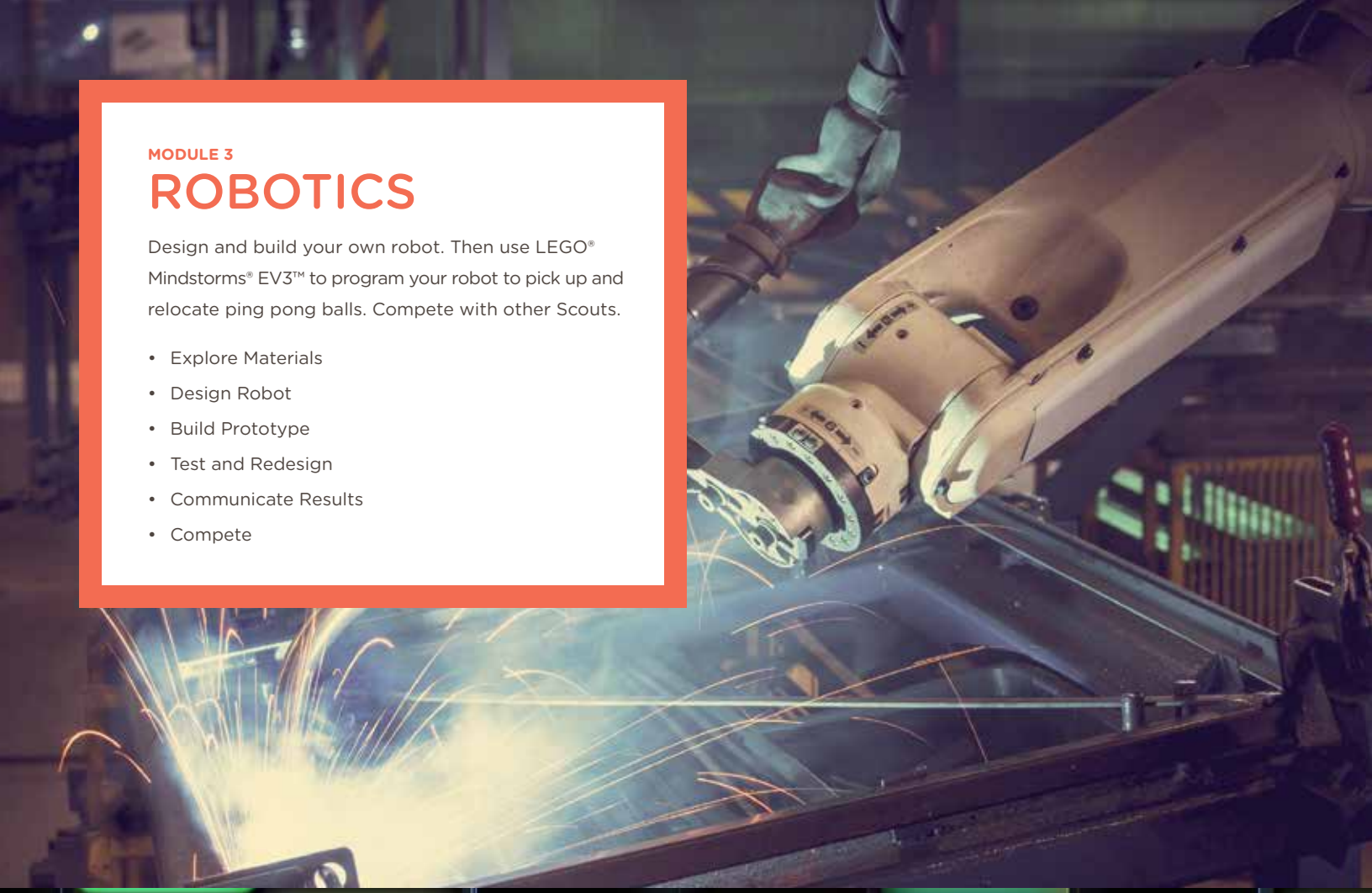


MODULE 2

CHEMISTRY

Explore chemical reactions—and make some explosions. What soft drink makes the biggest boom? Use chemistry to make your own ice cream. Learn a secret recipe for brushing an elephant's teeth. How do you make exploding hydrogen balloons? It's time to find out!

- Exothermic Elephants and Volcanoes
- Exploring Ice Cream
- Making Hydrogen Balloons
- Soda Geyser Reactions
- It's a Gas!
- Investigating Spectra



MODULE 3

ROBOTICS

Design and build your own robot. Then use LEGO® Mindstorms® EV3™ to program your robot to pick up and relocate ping pong balls. Compete with other Scouts.

- Explore Materials
- Design Robot
- Build Prototype
- Test and Redesign
- Communicate Results
- Compete

MODULE 4

FORENSIC SCIENCE

Solve a murder mystery by applying forensic science techniques. Conduct gel electrophoresis as you explore DNA and how it applies to forensic science. Investigate blood typing activities using simulated blood. Learn how to lift fingerprints and take casts of footprints.

- Learn Forensic Techniques
- Blood Typing
- Gel Electrophoresis
- Processing the Crime Scene
- Applying Forensic Techniques to Solve the Crime
- Outing to a Local Crime Lab or Court House

ILM

VERTICAL FARMING

ILM

SUSTAINABLE PAPER

Independent study, mentoring and publishing opportunities

ILM

UNIT CONVERSION

ILM

GRAPHING LAB

ILM

DENSITY LAB

ILM

LEAF COLLECTION

FREQUENTLY ASKED QUESTIONS

Have questions? Take a look at the FAQs below. If you don't see the answer you need, visit stemscouts.org or feel free to contact us.

Q What does STEM stand for?

A STEM stands for science, technology, engineering and mathematics. STEM Scouts is a new program that introduces youth to these disciplines through exciting and fun hands-on experiments.

Q Who can be a STEM Scout? How old do you have to be?

A STEM Scouts is for both girls and boys in grades 3 through 12. It is a pilot program of the Boys Scouts of America, currently available only in select councils.

Q What do STEM Scouts do?

A STEM Scouts meet weekly in groups called Labs. They work with Lab leaders and STEM professionals to do fun, hands-on experiments that teach STEM-related concepts and show how STEM knowledge is used both in everyday life and in the professional world.

STEM Scouts have the opportunity to develop their skills in leadership, communication, creative problem-solving, teamwork and research. High school students also have the opportunity to publish their work in a peer-reviewed journal and build a resume for college.

Q How is STEM Scouts different from regular Scouting?

A STEM Scouts is different from regular Scouting in that outdoor activities are only a portion of the activities and not the main focus. It is totally separate and entirely independent from core BSA programs. STEM Scouts is also more hands-on than regular school-sponsored STEM programs, with more fieldtrips and the opportunity for students to work directly with STEM professionals.

Q To what degree is the program hands-on?

A The bulk of each weekly meeting is spent engaging in various experiments. Each Scout has a specific role in the experiment, allowing everyone the chance to participate and to try different roles, from leading a team to doing technical work. Scouts who want to learn more about a specific topic may expand their knowledge by participating in individual learning modules.

Q Who is in charge of STEM Scout Labs? How many adults will be at every Lab gathering? Who are the professionals involved? How are they selected and approved?

A STEM Scouts is a pilot program of the Boy Scouts of America and operates under BSA guidelines. Individual labs are supervised by adult volunteers, some of whom are parents and many of whom work in STEM fields. Each unit has at least one female and one male volunteer. The STEM professionals help students understand research methods, STEM concepts, and STEM careers. All volunteers must be at least 21 years old, undergo a criminal background check and complete BSA's Youth Protection Training. Middle and high school labs have at least one leader with a STEM background.

Q What specific BSA policies and guidelines will apply to STEM Scouts?

A STEM Scouts follows the Scout Oath and Law with the goal of producing men and women who are leaders, display confidence, realize their skills and limitations, are respectful of others' opinions, are problem solvers in all aspects of life, look for opportunities to serve others, are good citizens, and demonstrate integrity in all phases of their lives. Each meeting will open with the Pledge, Scout Oath and Law. All Scouts and adult leaders agree to adhere to the guidelines in the *Guide to Safe Scouting* and to only perform experiments sanctioned by STEM Scouts.

Q How do you get involved as a youth? As a parent? As a volunteer?

A Students should find a Lab near them and can register by the website. Parents, we encourage you to be actively involved in STEM Scouts. Follow along with your child as he or she explores. We're also always looking for adult volunteers to join a Lab unit, help with a field trip or become a short-term volunteer.

Each Lab must be supported and sponsored by a Chartered Organization. Perhaps your company, school, place of worship or organization could be a Chartered Organization.

Q How much does it cost to become a STEM Scout?

A The cost is $200 yearly, which includes safety goggles and the core activities.

Q I'm not sure my family can afford the yearly cost. Do you offer financial aid?

A Yes! Talk to one of the leaders at a sign-up meeting, or contact us.

Q What time commitment is involved in being a STEM Scout?

A STEM Scouts meet weekly for about 90 minutes, for four- and six-week modules, with six to nine different modules per semester, which translates to a total of 28 weeks of activities, depending on the age group.

Q Is it possible to make small commitments of time—say for just one lab series or about six weeks—instead of the entire year?

A At this time, Scouts must sign up for an entire year (signups are at the beginning of each semester). One of our goals is teamwork, which is developed through consistent participation from each Scout.

There are, however, opportunities for adults to participate on a limited basis, such as serving as a field trip host or as a STEP volunteer (guest speaker, leading an experiment or an entire 4- or 6-week module).

Q When and where are STEM Scout meetings held?

A Meetings for different age groups are held weekly after school at locations near you. Chartered Organizations are often corporations, but can also be private schools, community centers, places of business, and other locations. At this time, public entities, including schools, CANNOT be Chartered Organizations.

Some areas also have a STEM Scout mobile lab, the Vortex, which travels around the area working with students interested in learning more about the world around them.

Q How do I find a STEM Scout program to join?

A If you don't live nearby but would like to bring STEM Scouts to your area, let us know by contacting us, and we will get in touch with you.

Q What role does the school play in the program? Does it vary by age grouping?

A Some STEM Labs are held at area schools and led by school staff who are volunteers with the program.

Q How will STEM Scouting impact a youth's future? Does it vary by the length of time a person is engaged in STEM Scouts? What makes STEM Scouting unique and in what ways does it prepare participants for the future?

A In addition to their expanded knowledge of STEM-related topics, older STEM Scouts will have the opportunity to publish and share their work through an online, peer-reviewed journal, giving them a sense of accomplishment and knowledge about research practices as well as a distinct competitive advantage when pursuing post-secondary education.

STEM Scouts also develop, through their lab activities, the kinds of skills that will stand them in good stead both in post-secondary education and in the workplace: improved communication, leadership, teamwork, and other intangible qualities.

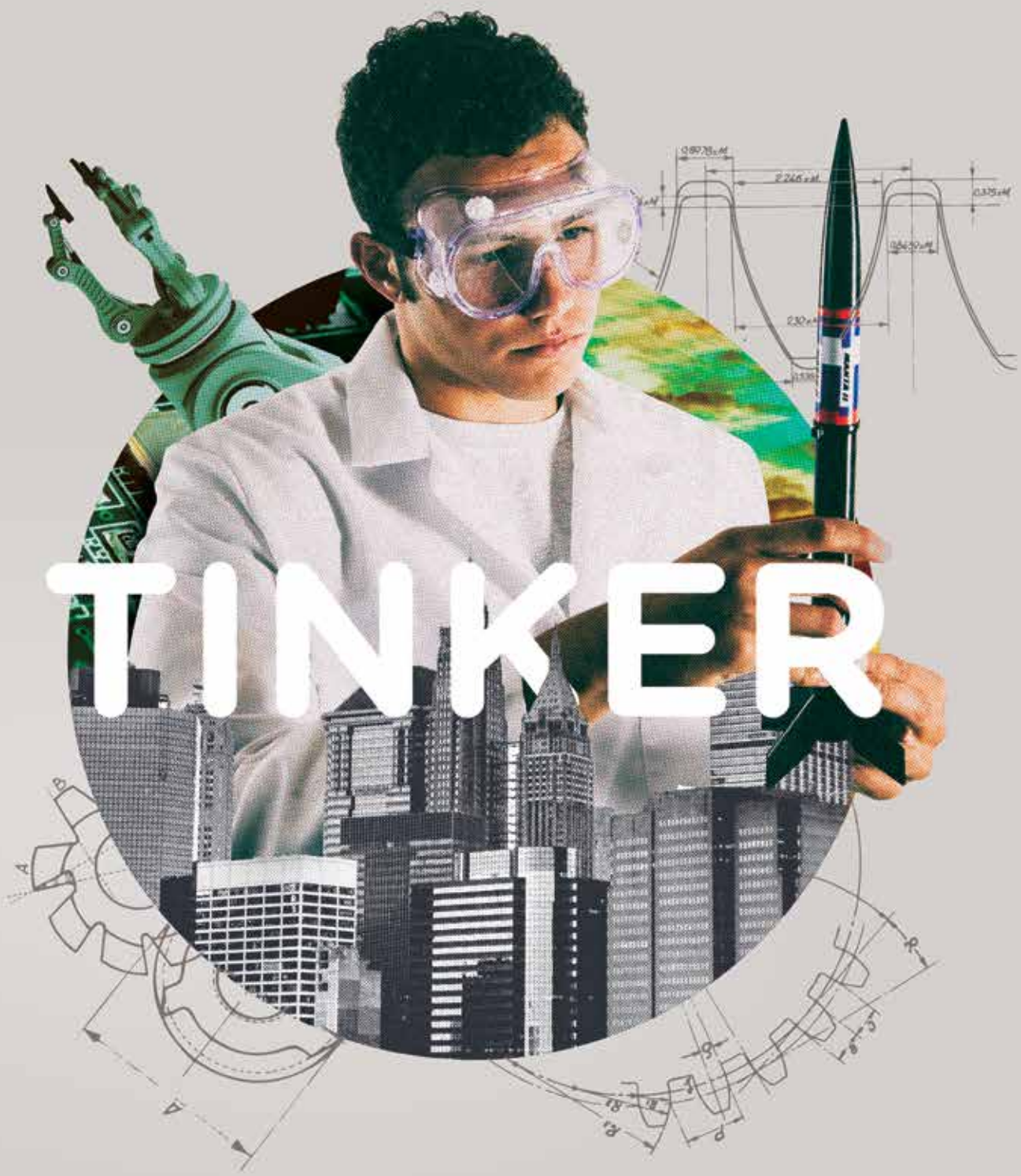
STEM Scouts also have direct interaction with mentors and volunteers who are STEM professionals and can help students learn more about potential careers.

Q How will participants stay engaged? How will it be kept fun, fast-paced and interesting?

A Our hands-on experiments are a big part of making each meeting fun and engaging. Scouts rotate through different roles on the team, a process which also keeps them involved and engaged as they learn to do different jobs.

Q Will there be some structured award system or success recognition built into the program?

A STEM Scouts does not have ranks, but Scouts can earn digital badges as well as achievement awards.



STEMSCOUTS.ORG