

50 FOOD SCIENCE LABS

EDIBLE EXPERIMENTS WITH FOOD



SCIENCE * TECHNOLOGY * ENGINEERING * MATHEMATICS

50 HANDS-ON SCIENCE PROJECTS WITH FOOD

SUPPORTS ENGINEERING & DESIGN PROCESS

PROMOTES CRITICAL THINKING & PROBLEM-SOLVING SKILLS



CREATED & DESIGNED BY ANDREW FRINKLE

50 FOOD SCIENCE LABS

EDIBLE EXPERIMENTS WITH FOOD

FIRST EDITION



IN THIS VOLUME

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WHAT ARE STEM AND STEAM?

STEM is an acronym for Science, Technology, Engineering, and Mathematics. All of the labs within this volume promote learning within these four fields. You might also find the acronym **STEAM** being used. STEAM is the addition of Art to the other four STEM fields. This book takes a unique route of presenting projects that all deal with food.

Learn more at www.50STEMLabs.com.

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HOW TO USE THIS BOOK

GENERAL SUGGESTIONS:

This book contains 50 different STEM lab activities. You will find a strong emphasis on designing a project, testing it, measuring the results, and reflecting upon what worked and did not work, which might lead to a redesign and retesting process. Technology can easily be incorporated by recording and documenting the process and creating reports and projects about the topic(s) afterward. Presentation and sharing of results is key to cooperative learning. Journals and log books should be kept as a record of the learning process.

There are some general suggestions and guidelines for each project, but it has deliberately been left without too much detail to allow the projects to be adapted to your classroom's individual needs. These are not recipes to follow to make a project or activity. These projects require critical thinking and problem solving skills.

There is no intended order to these projects, nor is it expected that you will do each project. It is highly recommended that you pick the ones you find to be most interesting or appropriate for each learning group, which might have to be slightly modified, depending on the learning and experience levels you are working with.

You will find some similar projects within this volume and in the additional volumes of the 50 STEM Labs Series. Attempting similar projects helps students build on previous learning experiences while making them adjust to new expectations and rules or materials in the new project. Many instructors have great success with thematic units or quarterly units on bridges, towers, or other sets of related projects.

Another key part of this series is the idea that learning science should not break the bank. Most projects are done with common and inexpensive school supplies, office supplies, or household objects. Students can even scavenge and recycle supplies for some projects.

Since this is an educational volume, graded assignment suggestions are provided, although your exact scoring will vary too much to provide an easy grading rubric.

RECIPES

01

SOLAR S'MORES

Create a solar heating device to cook your s'mores and melt chocolate.

02

ROCK CANDY

Create crystals out of various types of sugar in solutions.

03

CANDY ROCK CYCLES

Use candy to model the rock cycle.

04

CANDY FAMILY TREES

Use candy pieces to model examples of heredity.

05

COOKIE MAPS

Create maps out of cookie dough. Cook and eat them after preserving them with photographic evidence.

06

CEREAL SIFTERS

Create a device to sort out cereal by shape or size.

07

BUG EATERS

Create a realistic model of a bug out of food items.

08

TASTY TOWERS

Use food items to build the tallest tower possible.

09

IRON FOR BREAKFAST

Use magnets to prove there is iron in breakfast cereals.

10

MOON PHASE OREOS

Create models of the moon phases with cookies.

RECIPES

11

ANIMAL CRACKER FOOD CHAINS

Create a food chain or food web using animal crackers.

12

TASTY DNA

Create a double helix model with food items.

13

FISH TANKS

Create a realistic diorama featuring goldfish crackers.

14

SEED COUNTERS

Predict and count the seeds in various fruits.

15

MELTY TIME

Predict and measure the time it takes for various types of chocolate to melt.

16

CRUMBLY GEARS

Create a working set of gears from cookies or crackers.

17

VEGGIE SORTERS

Sort and classify veggies by their type.

18

SLOW ROAST

Determine the cooling speeds of different foods.

19

SENSITIVE NOSES

Test your sense of smell with different foods.

20

REFINED PALATE

Test your sense of taste with different foods.

RECIPES

21

HARD WATER

Experiment with the solubility and densities of various liquids.

22

SOLAR GRILLED CHEESE

Create a solar heating device to cook your grilled cheese.

23

PUDDING CRATERS

Create and measure craters in pudding.

24

MARSHMALLOW TREAT ROCKS

Use marshmallow treats to create rocks and model the rock cycle.

25

EDIBLE SOLAR SYSTEM

Create a proportionate planetary or solar system out of food.

26

SHOCKING FOODS

Determine which fruits or vegetables conduct the most electricity.

27

FOOD ARCHITECTS

Create a realistic model of a famous structure out of food.

28

GREASY SNACKS

Determine which snacks have the most oil in them.

29

FOOD RAINBOWS

Assemble a rainbow of foods. Learn about nutrients.

30

SOUNDS DELICIOUS

Determine what foods are being eaten by hearing the noises they make when they are chewed.

RECIPES

31

GOOD DEHYDRATIONS

Create a working food dehydrator.

32

FOOD CELLS

Create a model of a cell with food.

33

DYE JOBS

Test the transport of dyed water through various plants.

34

SWIM IN A JELLO OCEAN

Create a model ocean with jello.

35

SWEET CONSTRUCTIONS

Create a model from sugar in its various forms.

36

FLAVOR CLASS

Classify flavors of foods.

37

REGROWTH

Harvest and plant the seeds from various fruits and vegetables.

38

HOTDOG ROLLER

Create a hot dog roller that warms hot dogs.

39

COOKIE WEATHERING

Model weathering with cookies.

40

SATURATED KOOL-AID

Determine how much and what kind of granules can be dissolved into Kool-Aid.

RECIPES

41

FOOD MATTERS

Explore different states of matter with food.

42

VITAMIN HUNTERS

Learn about the nutrients in the foods you eat.

43

SLIMY FOODS

Measure the viscosity of various liquids.

44

SLICE AND DICE

Create a machine that cuts a specific sort of food.

45

GROWING BEARS

Observe the changes in gummy bears when they are placed in different liquids over extended periods of time.

46

LAYER CAKE EARTH

Create a model of the layers of Earth using cake and decorations.

47

SAVE THE FOOD

Determine the best way to preserve foods from browning.

48

SUGAR HUNT

Find and measure out how much sugar is in a variety of beverages or snacks.

49

EASY-BAKING IT

Create a working oven to bake food.

50

ANT BAIT

Test different foods to see which ones attract bugs or other creatures first.

50 FOOD SCIENCE LABS

EDIBLE EXPERIMENTS WITH FOOD

EACH OF THE 50 PROJECTS CONTAINS:

- MISSION TITLE WITH TOPIC TAGS
- MISSION GOALS
- MISSION GUIDELINES & EXPECTATIONS
- SUGGESTED MATERIALS
- GRADING SUGGESTIONS
- FOLLOW-UP ASSIGNMENTS



* CHOCOLATE * HEAT TRANSFER * SUNLIGHT *

MISSION BRIEFING:

Create a solar heating device to cook your s'mores and melt chocolate.

MISSION SUPPLIES:

REQUIRED MATERIALS:

- Chocolate
- Graham crackers or cookies
- Marshmallows

OPTIONAL MATERIALS:

- Tin foil
- Cardboard
- Tape
- Hand lenses
- Plastic wrap
- Stopwatch

MISSION GUIDELINES:

1. You will design a device to cook your s'mores using sunlight.
 2. S'mores may be made of any size, but should include a cookie or cracker, chocolate, and marshmallows.
 3. All chocolate melting should be from solar heat.
 4. Additional scavenged materials may be used, provided they are approved first.
- *TEACHERS OPTIONS: You may toast the marshmallows first, but they must be completely cooled before adding to your s'more. Also, you may record the melting times for the sake of competition and/or comparison.*

MISSION DEBRIEFING:

- Scoring based on results compared to other teams
- Blueprints & design diagrams for your project
- A reflection on your experiences with this project
- A follow-up project about s'mores, campfires, and treats



* CRYSTALS * SOLUTIONS * SATURATION *

MISSION BRIEFING:

Create crystals out of various types of sugar in solutions.

MISSION SUPPLIES:

REQUIRED MATERIALS:

- Hot water
- Spoons
- Clothespins
- Burner or microwave
- Glass containers or jars
- Wooden skewers or chopsticks
- White sugar

OPTIONAL MATERIALS:

- Food coloring
- Brown sugar
- Raw sugar
- Powdered sugar
- Splenda or artificial sweetener
- Salt

MISSION GUIDELINES:

1. Observe safety around hot liquids.
 2. You will create a super-saturated solution with hot water. Keep the water warm and stir in as much sugar as you can, adding more until no more will dissolve into the hot water.
 3. Transfer the sugar water to a narrow glass jar. Repeat with other jars or types of sugar or mixtures of sugars.
 4. Dip a skewer or chopstick most of the way into the jar of water. Use a clothespin to hold it in place, setting it across the lip of the jar.
 5. Add food coloring if you desire. Add until the solution is dark with the coloring.
 6. Allow the material to sit. Check it daily to observe growth.
- **SAFETY NOTE:** You must use proper safety when doing this project. Use gloves, goggles, and other proper safety equipment when handling hot materials.

MISSION DEBRIEFING:

- A journal of day-to-day illustrations or photos of the results
- A reflection on your experiences with this project
- A follow-up project about crystals, sugar, types of sugar or sweeteners



* GEOLOGY * MELTING * ROCK CYCLE *

MISSION BRIEFING:

Use candy to model the rock cycle.

MISSION SUPPLIES:

REQUIRED MATERIALS:

- Hot plate or microwave
- Wax paper or parchment paper
- Candy chews, like starburst, taffy, or tootsie rolls.

OPTIONAL MATERIALS:

- Nerds
- Sugar crystals

MISSION GUIDELINES:

1. Start by cutting up the candy chews into little pieces. It's best to have multiple colors for the best effect.
 2. Gather the little pieces onto a piece of parchment or waxed paper. Smash them together with light pressure, making a sedimentary rock. Examine the sedimentary rock (cementing of sediments).
 3. Next, smash them down harder within the parchment with your hands, looking at how the sediments are deformed into smaller, flatter layers. Examine the metamorphic rock (heat and pressure).
 4. Finally, use heat to melt the rock. Examine how the colors have mixed and how this Igneous rock has changed in appearance (melting and cooling).
- *TEACHERS OPTIONS: Add things like nerds candy or sugar crystals to model geodes and other rocks with crystal pieces. Experiment with changing the order of the steps.*

MISSION DEBRIEFING:

- Scoring based on results compared to other teams
- A reflection on your experiences with this project
- A follow-up project about the rock cycle, geology, or a type of rock/mineral



* DNA * HEREDITY * TRAITS *

MISSION BRIEFING:

Use candy pieces to model examples of heredity.

MISSION SUPPLIES:

REQUIRED MATERIALS:

- M&M's or other candy pieces, like Skittles or Reese's Pieces

MISSION GUIDELINES:

1. Create genetic codes for each color of candy. Teachers can supply the codes or students can help design them. Example: Green M&M = green eyes.
 2. DNA codes can be for a specific trait or a variety of traits, like only eye colors, or eye, hair, and skin colors. DNA codes can also be for animals or fictitious creatures.
 3. Determine which traits are recessive and dominant.
 4. Create a series of examples of reproduction. What are the resulting traits? Try not to eat too many traits as you create your lineages.
 5. Illustrate examples.
- *TEACHERS OPTIONS: Create probability charts, fill out Punnet Squares, or otherwise track the data. You can also chart generational trends and ratios where a dominant trait is introduced into a completely recessive population.*

MISSION DEBRIEFING:

- Scoring based on results compared to other teams
- A reflection on your experiences with this project
- A follow-up project about heredity, and common human recessive/dominant traits



* GEOLOGY * LANDFORMS *

MISSION BRIEFING:

Create maps out of cookie dough. Cook and eat them after preserving them with photographic evidence.

MISSION SUPPLIES:

REQUIRED MATERIALS:

- Cookie dough or tubes of bread rolls
- Wax paper or parchment to work on
- Toothpicks
- Paper
- Tape
- Oven
- Cookie sheet

OPTIONAL MATERIALS:

- M&M's or raisins
- Food coloring
- Other materials to make your relief map look more realistic

MISSION GUIDELINES:

1. Create a model relief map with the food items provided.
 2. Your map can be of a specific region, state, or country, or it can be of a fictitious region.
 3. Decorate with additional food items to denote a variety of landforms.
 4. Cook the map carefully.
 5. Label the landforms with small toothpick flags.
- *TEACHERS OPTIONS: Create a points scale to make more difficult to model features worth more. A rubric can make sure at least a minimum amount of features are included.*

MISSION DEBRIEFING:

- Scoring based on results compared to other teams
- A reflection on your experiences with this project
- A follow-up project about the physical processes that shape landforms



RESOURCE PAGES

* BLUEPRINTS * DATA * GRAPHING * REFLECTION * JOURNALS *

REUSABLE FORMS AND PAGES:



PLANNING SHEET

NAME:

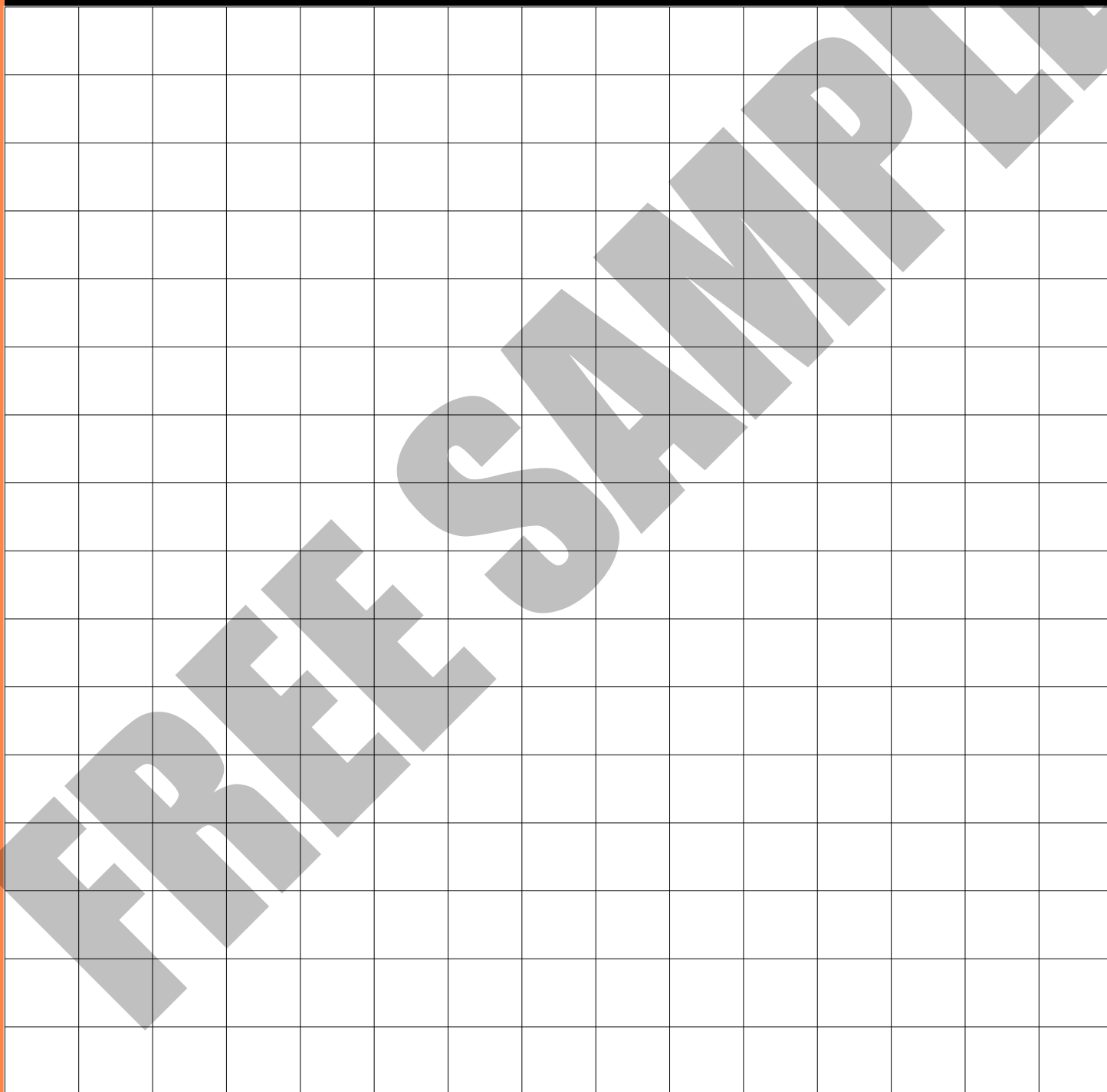
PLANNING AREA

FREE SAMPLE

BLUEPRINT SHEET

NAME:

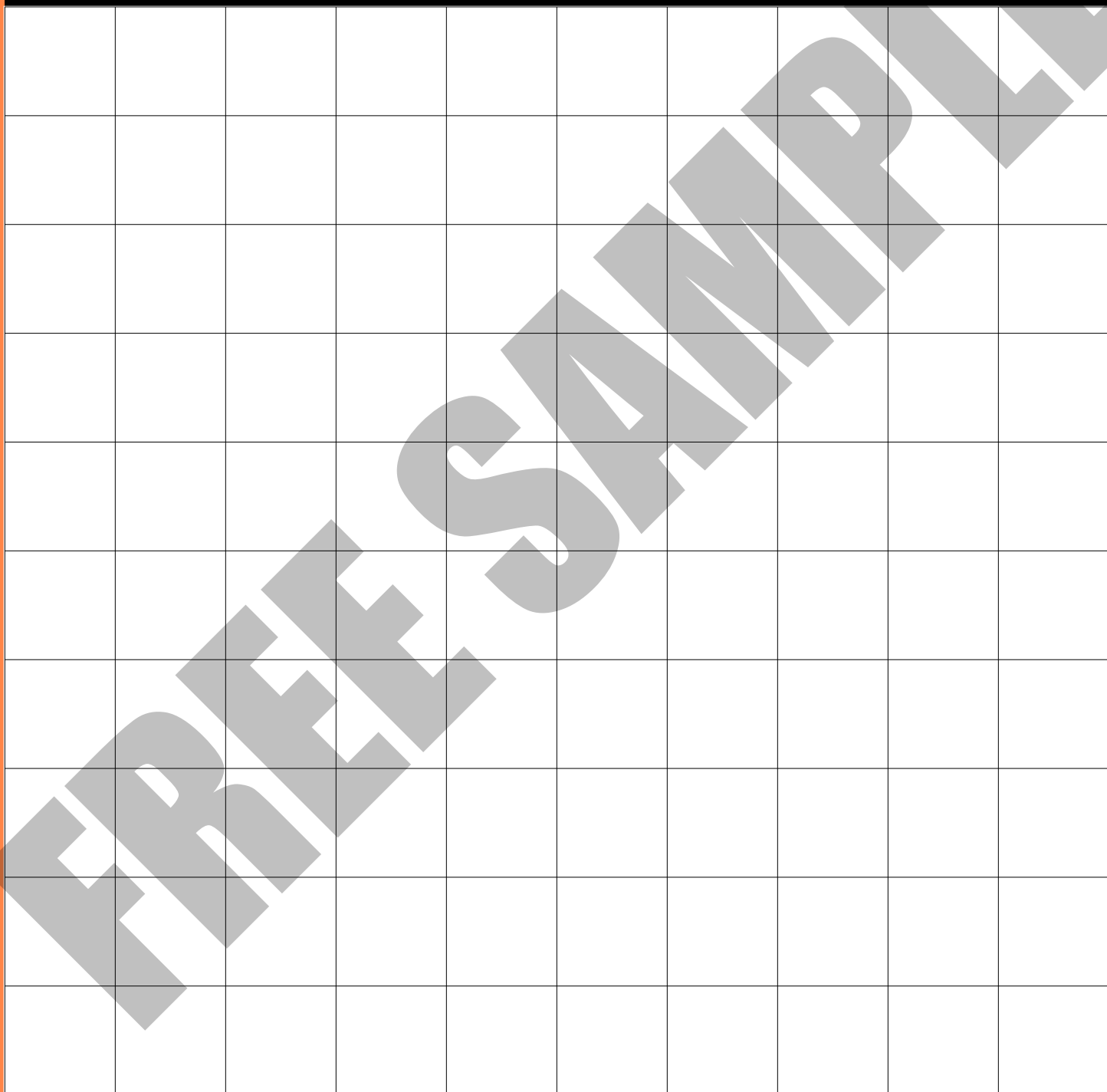
DESIGN AREA



BLUEPRINT SHEET

NAME:

DESIGN AREA



DATA SHEET

NAME:

DATA RECORD AREA

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FREE SAMPLE

DATA SHEET

NAME:

DATA RECORD AREA

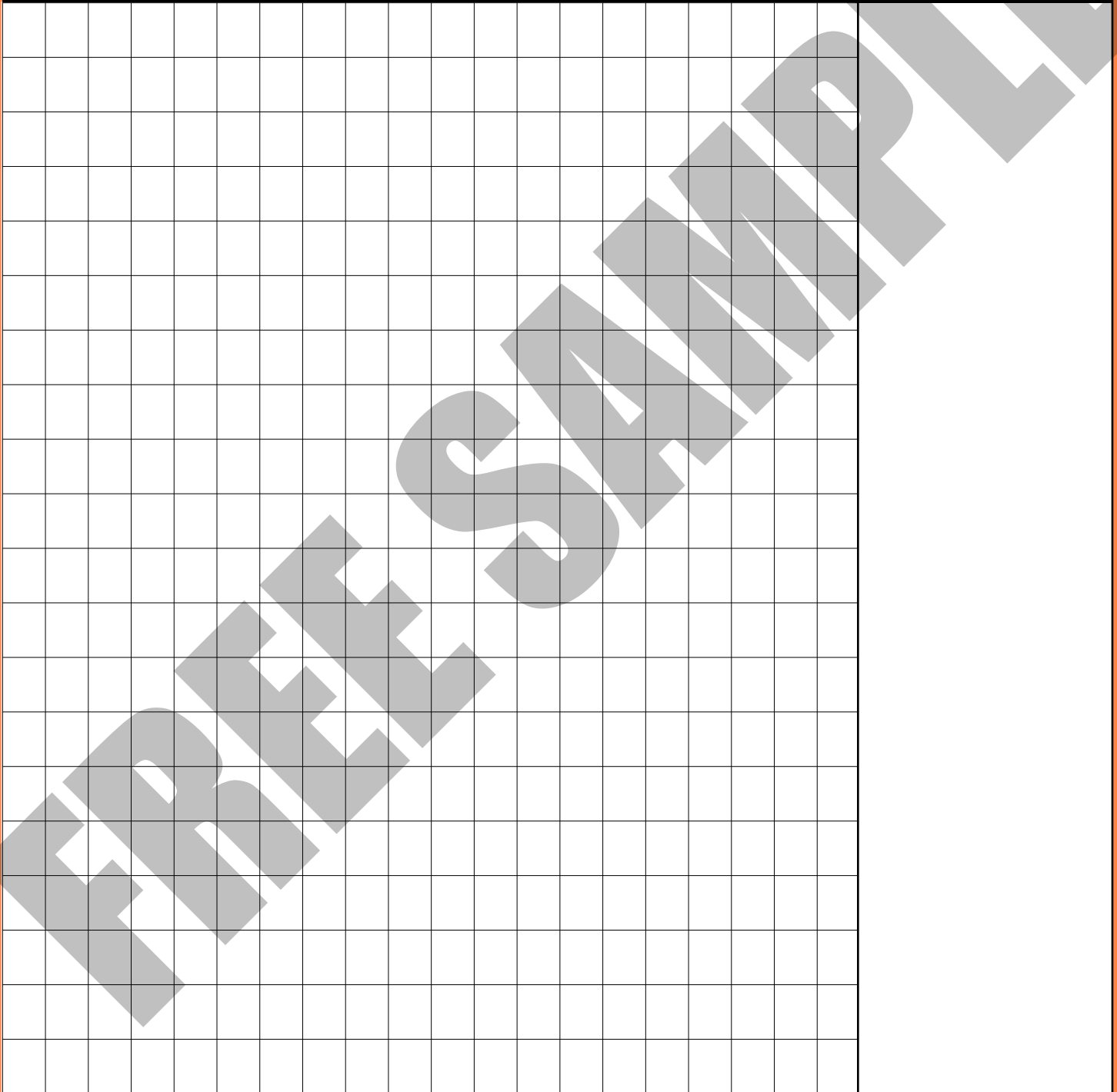
FREE SAMPLE

GRAPHING SHEET

SINGLE TRIAL DATA SHEET

DATA GRAPH

LEGEND



ABOUT THE CHEF

ANDREW FRINKLE



ABOUT THE AUTHOR:

Andrew Frinkle is an award-nominated teacher and writer with experience in America and overseas, as well as years of developing educational materials for big name educational sites like Have Fun Teaching. He has taught PreK all the way up to adult classes, and has focused on ESOL/EFL techniques and STEM Education.

With two young children at home now, he's been developing more and more teaching strategies and books aimed at helping young learners, as well as games and activity books for primary grades.

Andrew Frinkle is the founder & owner of MediaStream Press LLC. He also writes fantasy and science fiction novels under the pen name Velerion Damarke and writes/illustrates children's fiction as Andrew Frinkle. Additionally, he is working on educational music albums.

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- www.common-core-assessments.com
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WHAT'S DIFFERENT ABOUT THIS BOOK?

GET THOSE SAME 50 GREAT LABS YOU'VE COME TO EXPECT FROM THE 50 STEM LABS SERIES AND 50 LEARNING LABS SERIES, BUT WITH A HUNGRY LITTLE ADDITION!

- **EVERY PROJECT DEALS WITH FOOD!**
- **SINCE MANY PROJECTS ARE EDIBLE, THEY'RE GOING TO BE THAT MUCH MORE INTERESTING TO KIDS!**
- **AFFORDABLE PROJECTS CAN BE DONE WITH COMMON ITEMS FOUND AT DISCOUNT STORES OR ALREADY IN YOUR PANTRY!**
- **YOU CAN FINALLY PLAY WITH YOUR FOOD AND NOT GET IN TROUBLE!**

