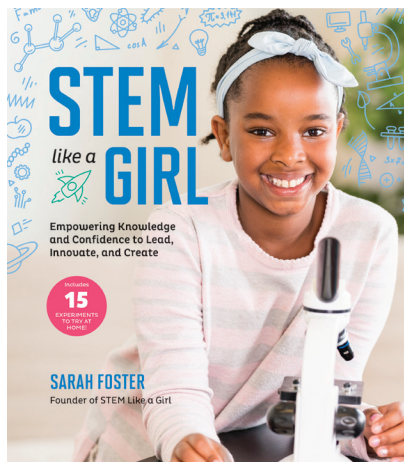




**A Study Guide from
BLACK DOG &
LEVENTHAL**



STEM LIKE A GIRL
*Empowering Knowledge
and Confidence to Lead,
Innovate, and Create*

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INTRODUCTION

WHAT DOES STEM STAND FOR?

1. Think about your daily routine. How often do you use something that's part of your everyday life that involves STEM?
2. What does STEM stand for? Which aspect of STEM are you most curious about?
3. Write down 5 questions you have about STEM and 5 things you already know.

SCIENCE

1. What is the definition of science? Can you summarize the definition in your own words?
2. How many different fields of science are there?
3. What is life science? Physical science?
4. What does "ecology" mean? Have you studied any of the different components of science in school?
5. Why do you think it is important to study how living things work and interact with each other?
6. What are the main components of physical science?
7. What is the definition of "matter?" Which fields of science studies matter?
8. What does a chemist do? Research famous chemists - how many women can you find?
9. "Observing and understanding the _____ building blocks that make up our world and how this matter behaves and interacts is important for many reasons." What are a few of those reasons? Can you name any that are not included in the book?

TECHNOLOGY

1. How would you define "technology?"
2. Provide examples of how STEM intersects with technology.
3. "It can help to think of technology as more of an _____ than a specific field."
4. Can you think of any technological inventions that combine the different categories of STEM?"
5. "Technology is the _____ that runs from the _____ to the _____ and connects everything together."

ENGINEERING

1. What are the four main branches of engineering?
2. What do chemical engineers do?
3. What is a civil engineer? Can you name two things on which civil engineers work? What about an electrical engineer?
4. What is the difference between a mechanical engineer and an electrical engineer?

MATH

1. How do you feel about math? Some people find it scary! Why do you think that is? If you are one of those people, what do you hope to learn from the activities in this book?
2. Did you know that you use math every day without realizing it?! What are some examples of how you use math in your daily routine?
3. What is the definition of geometry? Have you studied geometry yet in school?
4. Read the quote by Stephanie Salomone on page 18. Think about what you want to be when you grow up - will there be math in your future?

ASKING QUESTIONS, SOLVING PROBLEMS

1. Why do we group these fields together to become STEM?
2. “STEM allows us to address each _____ of a _____ while working toward the whole _____.”
3. Research scientist and conservationist Jane Goodall. What did you learn about her? What does a conservationist do - which parts of STEM does she use in her life?
4. What is one thing all scientists, technologists, engineers, and mathematicians have in common?
5. Who said, “The important thing is not to stop questioning. Curiosity has its own reason for existing.” How do you feel about this quotation? Do you think it’s true?
6. Why is teamwork important in STEM?
7. Who is Sylvia Earle? What was her contribution to marine biology?

WHY SHOULD GIRLS CARE ABOUT STEM?

1. Research Mae Jemison and Debbie Sterling. What information can you find about them online? What are their contributions to the world of STEM? Can you draw inspiration from their accomplishments?
2. What are some of the biggest reasons why you should care about STEM?
3. What are “critical thinking skills” and why would they be important in your life?
4. “STEM teaches you how to make _____ about the world around you and _____ problems or areas for improvement.” Can you think of anything in your life that needs improvement? How could you use STEM to solve that problem?
5. Why is it important for women and girls to be included in STEM?
6. “Research has shown that the brains of men and women are wired differently, allowing each gender to think and process information in distinct ways.” What are some examples of this idea?

FAILURE IS A GOOD THING!

1. Think about a time you tried to do something and it didn’t work out the way you thought it would. How did you feel?
2. What would happen if everyone stopped trying the first time they failed? Would anything be different in your life if you quit on the first try?
3. What have you learned from failure?
4. FAIL can be an acronym for “First Attempt In Learning.” Make a list of all the things you want to try or accomplish. Then, write down your “post-failure plan.” If you do not succeed at your new skill, how will you look at failure in a positive way and keep going? Where will your failure take you?

THE DESIGN PROCESS

1. What is the design process? (Use the chart on page 33 to help guide you!)
2. Use the design process to evaluate any problem you would like to solve. Write down each step of the process and what action you will take in order to attempt to solve the problem. What did you discover?
3. “Remember that all _____, whether big or small, is an opportunity to _____ and _____.”

HOW TO USE THIS BOOK

1. Use the experiment test sheet on page 37 to record your work and document your experiments.
2. Look through the activities in the “Girls and Their Projects” section. Which experiments would you like to try?
3. Take a look at the “Design Challenges” starting on page 192. There is more than one way to solve those problems - you can work on those challenges a few different times to find the solution! Which challenges do you want to tackle?
4. Get a group of girls together to test out some of these experiments! Throw a STEM party and practice your teamwork and leadership skills with your group. What did you learn by working together?
5. The “At Home STEM Kit” on page 39 is a great place to start when looking for resources to complete these projects. If you are able, take a trip to your local craft store to pick up your supplies with your friends!
6. Please read through the safety notes on page 41 with an adult before you begin any of the activities included in this book. Remember, a big part of STEM is to be prepared and ask questions! Make sure all of your safety precautions are in place before you jump into an activity.

THE GIRLS AND THEIR PROJECTS

AIR CANNON

1. Read through the Q&A pages for Hazel, Daphne, and Sydney. Can you find any similar character traits among them? Do you share any of their traits?
2. Research some of the women the girls look up to. What did you learn about them? Who do YOU look up to and why?
3. Try the air cannon activity! Use the experiment sheet on page 37 to help guide you through the process.
4. What did you learn from reading more about the air cannon's STEM application?

CRUMBLING CAVES

1. Read through the Q&A pages for Aine, Carina, and Krista. Can you find any similar character traits among them? Do you share any of their traits?
2. What are some examples the girls gave to learn STEM at home? Are there any activities you'd like to try?
3. Try the crumbling caves activity! Use the experiment sheet on page 37 to help guide you through the process.
4. What did you learn from reading more about the crumbling caves STEM application?

SQUISHY SOAP

1. Read through the Q&A pages for Lily and Molly. Can you find any similar character traits between them? Do you share any of their traits?
2. What are some examples the girls gave to learn STEM at home? Are there any activities you'd like to try?
3. Try the squishy soap activity! Use the experiment sheet on page 37 to help guide you through the process.
4. What did you learn from reading more about the squishy soap STEM application?

PUDDLING PENNIES

1. Read through the Q&A pages for Sophia, Maya, and Si-uma. Can you find any similar character traits between them? Do you share any of their traits?
2. What are some examples the girls gave to learn STEM at home? Are there any activities you'd like to try?
3. Try the puddling pennies activity! Use the experiment sheet on page 37 to help guide you through the process.
4. What did you learn from reading more about the puddling pennies STEM application? What is "surface tension?"

SOUND SCIENCE

1. Read through the Q&A pages for Isabella and Audrey. Can you find any similar character traits between them? Do you share any of their traits?
2. What are some examples the girls gave to learn STEM at home? Are there any activities you'd like to try?
3. Try the sound science activity! Use the experiment sheet on page 37 to help guide you through the process.
4. What did you learn from reading more about the sound science STEM application? What is "frequency of oscillation?"

BLAST OFF

1. Read through the Q&A pages for Maisy, Luchia, and Cece. Can you find any similar character traits between them? Do you share any of their traits?
2. Who was Ruth Bader Ginsburg?
3. What are some examples the girls gave to learn STEM at home? Are there any activities you'd like to try?
4. Try the blast off activity! Use the experiment sheet on page 37 to help guide you through the process.
5. What did you learn from reading more about the blast off STEM application? What is the definition of "aerodynamics?"

COLOR SEPARATION

1. Read through the Q&A pages for Ella and Ursula. Can you find any similar character traits between them? Do you share any of their traits?
2. What are some examples the girls gave to learn STEM at home? Are there any activities you'd like to try?
3. Try the color separation activity! Use the experiment sheet on page 37 to help guide you through the process.
4. What did you learn from reading more about the color separation STEM application? What is "paper chromatography?"
5. Did you try Test #2? What happened?

FIZZY FLOWERS

1. Read through the Q&A pages for Kate, Sakina, and Juliette. Can you find any similar character traits between them? Do you share any of their traits?
2. What are some examples the girls gave to learn STEM at home? Are there any activities you'd like to try?
3. Try the fizzy flowers activity! Use the experiment sheet on page 37 to help guide you through the process.
4. What did you learn from reading more about the fizzy flowers STEM application? During the acid-base reaction that happens, what gas makes the fizzy bubbles?"

MARBLE MAZE

1. Read through the Q&A pages for Olivia and Laila. Can you find any similar character traits between them? Do you share any of their traits?
2. What are some examples the girls gave to learn STEM at home? Are there any activities you'd like to try?
3. Try the marble maze activity! Use the experiment sheet on page 37 to help guide you through the process.
4. What did you learn from reading more about the marble maze STEM application?

FRUITY DNA

1. Read through the Q&A pages for Rachel, Birtukan, and Zahra. Can you find any similar character traits between them? Do you share any of their traits?
2. What are some examples the girls gave to learn STEM at home? Are there any activities you'd like to try?
3. Try the fruity DNA activity! Use the experiment sheet on page 37 to help guide you through the process.
4. What did you learn from reading more about the fruity DNA STEM application? What does DNA stand for? What is a "genome sequence?"

CREATIVE CODING

1. Read through the Q&A pages for Ellie, Maris, and Julia. Can you find any similar character traits between them? Do you share any of their traits?
2. What are some examples the girls gave to learn STEM at home? Are there any activities you'd like to try?
3. Try the creative coding activity! Use the experiment sheet on page 37 to help guide you through the process.
4. What did you learn from reading more about the creative coding STEM application? What is "binary code?" What is a good example of this code?

DESIGN CHALLENGES

LET'S RACE

1. Define thrust, drag, and friction. What did you learn about these terms in this challenge?
2. What is Newton's Third Law of Motion?
3. Who does Lena look up to and why?

HELPING HANDS

1. What are prosthetic devices?
2. What is Devon's advice for girls who want to try STEM?

WINDY ART

1. What do you think: can art and engineering go together? What are some examples of this pairing?
2. What did you learn about Abby?

RAIN, RAIN, GO AWAY!

1. How does a heavy rain affect forests and cities differently?
2. What is "urban runoff?"
3. What did you learn from Liv, Natalie, and Gatee?

COMMON CORE STANDARDS

ENGLISH LANGUAGE ARTS - READING INFORMATIONAL TEXTS (GRADE 4)

KEY IDEAS AND DETAILS:

CCSS.ELA-LITERACY.RI.4.1

Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

CCSS.ELA-LITERACY.RI.4.2

Determine the main idea of a text and explain how it is supported by key details; summarize the text.

CCSS.ELA-LITERACY.RI.4.3

Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

CRAFT AND STRUCTURE:

CCSS.ELA-LITERACY.RI.4.4

Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area.

CCSS.ELA-LITERACY.RI.4.5

Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in a text or part of a text.

CCSS.ELA-LITERACY.RI.4.6

Compare and contrast a firsthand and secondhand account of the same event or topic; describe the differences in focus and the information provided.

INTEGRATION OF KNOWLEDGE AND IDEAS:

CCSS.ELA-LITERACY.RI.4.7

Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

ENGLISH LANGUAGE ARTS - READING INFORMATIONAL TEXTS (GRADE 5)

KEY IDEAS AND DETAILS:

CCSS.ELA-LITERACY.RI.5.1

Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.

CCSS.ELA-LITERACY.RI.5.2

Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.

CCSS.ELA-LITERACY.RI.5.3

Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.

CRAFT AND STRUCTURE:

CCSS.ELA-LITERACY.RI.5.4

Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 5 topic or subject area.

CCSS.ELA-LITERACY.RI.5.5

Compare and contrast the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in two or more texts.

CCSS.ELA-LITERACY.RI.5.6

Analyze multiple accounts of the same event or topic, noting important similarities and differences in the point of view they represent.

INTEGRATION OF KNOWLEDGE AND IDEAS:

CCSS.ELA-LITERACY.RI.5.7

Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.

CCSS.ELA-LITERACY.RI.5.8

Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s).

ENGLISH LANGUAGE ARTS - READING INFORMATIONAL TEXTS (GRADE 6)

KEY IDEAS AND DETAILS:

CCSS.ELA-LITERACY.RI.6.1

Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

CCSS.ELA-LITERACY.RI.6.2

Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.

CCSS.ELA-LITERACY.RI.6.3

Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text (e.g., through examples or anecdotes).

CRAFT AND STRUCTURE:

CCSS.ELA-LITERACY.RI.6.4

Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.

English Language Arts - Science and Technical Subjects:
(Grades 6-8)

Key Ideas and Details:

CCSS.ELA-LITERACY.RST.6-8.1

Cite specific textual evidence to support analysis of science and technical texts.

CCSS.ELA-LITERACY.RST.6-8.2

Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

CCSS.ELA-LITERACY.RST.6-8.3

Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

CRAFT AND STRUCTURE:

CCSS.ELA-LITERACY.RST.6-8.4

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

CCSS.ELA-LITERACY.RST.6-8.5

Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

CCSS.ELA-LITERACY.RST.6-8.6

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

INTEGRATION OF KNOWLEDGE AND IDEAS:

CCSS.ELA-LITERACY.RST.6-8.7

Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

CCSS.ELA-LITERACY.RST.6-8.8

Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

CCSS.ELA-LITERACY.RST.6-8.9

Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

