STEM Basketball Curriculum
We greatly appreciate your purchase of our STEM Basketball kit. In your kit, you will find all the items you need to transform your students into critical thinkers.

Another advantage of having any STEM Sports program is that it is designed to have a long shelf-life and is flexible to be applied in classrooms, during after-school programs, and even in camp settings.

STEM Basketball is not the only program we have available. Check out www.STEMSports.com for additional sports such as BMX, volleyball, soccer, football, and multi-sport. Each and every curricula are aligned with Next Generation Science Standards (NGSS) and designed by the most knowledgeable people in education and sport.

We sincerely hope you and your students enjoy this STEM Sports curriculum!
INTRODUCTION

STRUCTURE:
This STEM Basketball manual is designed to deliver content for 16+ hours of instruction for 10 students (5 pairs) as a project based, student-centered, student-led program. The enclosed curriculum is your guide as a teacher/administrator/volunteer to implement the program. How you format that instruction is up to you. In the back of this book are the worksheets for each lesson. The worksheets are to be copied for each student to use and keep as they work their way through each exercise. While each school and learning environment is different, this guide and the proposed structure are for planning purposes only.

DISCLAIMER
This curriculum, including any/all portions of this kit/equipment are intended for educational purposes only. The sport of basketball involves risk of injury, loss and damage. By choosing to partake in this program, all teachers, students, and participants assume full responsibility for such risks. This curriculum makes no representation or warranty, expressed or implied, including but not limited to any warranty of merchantability or fitness for a particular purpose. There are risks associated with participation in any athletic activity, and the student/teacher/participant is responsible for any potential risks associated with these activities. STEM Sports shall not incur any liability for any damages, including but not limited to, direct, indirect, special or consequential damages arising out of, resulting from, or in any way connected to the use of this curriculum, whether or not based upon warranty, contract, or otherwise, whether or not injury was sustained by persons or property, and whether or not loss was sustained from, or rose out of, the implementation of this curriculum. The curriculum contained within this document is the property of STEM Sports, and may not be reproduced or otherwise distributed for use without the written consent of STEM Sports.

See Appendix to reference Next Generation Science Standards and Common Core State Standards connections.
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MODULES
Module 2.0  Science of Basketball

CONCEPT: Energy Transfer and Conservation – Inertia in Practice vs. Theory

OBJECTIVE: Students will be able to identify the types of energy and energy transformations inherent in the equipment, environment, and game play as it relates to the sport of basketball.

ACTIVITY:

Students conduct experiments measuring the total height, number, and duration of a bouncing basketball dropped from a variety of heights, and attempt to identify patterns in behavior of the ball.

1. With a small group or a partner, find a carpeted floor/surface next to a wall.
2. Check to ensure that your basketball is set to the recommended air pressure listed on the ball (PSI).
3. From the floor, measure 48 inches up the wall and mark the spot with masking tape.
4. Holding the ball against the wall, line up the bottom of the ball with the top of the tape.
5. From the measured height, drop the ball.
6. One partner should be counting the number of times the ball bounces until it stops bouncing and comes to a rest.
7. Another partner should be using the digital timer to record the total time the ball is moving, from the time it drops until the time it stops bouncing. Record data.
8. Using the same ball and surface, repeat steps 2-5 but this time from a height of 24 inches.
9. Now find a hard floor (wood/concrete) next to a wall.
10. Repeat steps 2-5 and drop the ball from the same two distances (48 and 24 inches).
CONCEPT: Energy Transfer and Conservation – Inertia in Practice vs. Theory

OBJECTIVE: Students will be able to identify the types of energy and energy transformations inherent in the equipment, environment, and game play as it relates to the sport of basketball.

QUESTIONS:
1. Which surface produced the greater number of bounces? Why?
2. Using the worksheet, compare the number of bounces from 48 and 24 inches. Did it bounce twice as much from 48 inches as it did from 24 inches? Why or why not?
3. Now do the same thing with the times from the digital timer. Did the ball bounce for half the time when dropped from 24 inches as compared to 48 inches?
4. In your opinion, if you dropped the ball from 96 inches would it produce twice the number of bounces as it did from 48 inches? What about total time bouncing? Why or why not?

OUTCOME:
Students should be able to construct explanations and use models to demonstrate how energy, its conversion, and transformations impact the way people play and understand the game of basketball. Students should also be able to apply their understandings of the lesson’s relevant concepts to a diverse range of situations encountered both on and off the court.

RELATED SKILLSET:
Dribbling is a fundamental skill in basketball. When you dribble you exert a force on the ball. The ball collides with the ground and bounces back up. The more elastic the collision between the ball and the ground, the higher the ball bounces. The key to a good dribble is finding the right balance of force and energy to maintain a steady, consistent dribble resulting in good ball control.

STANDARDS:
See appendix on page 30 to reference CCSS.ELA-Literacy.

MATERIALS

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WORKSHEETS
1. Fill in your projections:
Make estimates before gathering data

48 inch ball drop:
How many times do you think the ball will bounce on wood/concrete? __________________________
How many times do you think the ball will bounce on carpet? __________________________
How long do you think the ball will keep bouncing on wood/concrete? __________________________
How long do you think the ball will keep bouncing on carpet? __________________________

24 inch ball drop:
How many times do you think the ball will bounce on wood/concrete? __________________________
How many times do you think the ball will bounce on carpet? __________________________
How long do you think the ball will keep bouncing on wood/concrete? __________________________
How long do you think the ball will keep bouncing on carpet? __________________________

2. Fill in your measurements:
Ball Drop on Carpet

48 inch ball drop:
Number of bounces until ball stopped _________ Duration of time ball was bouncing _________

24 inch ball drop:
Number of bounces until ball stopped _________ Duration of time ball was bouncing _________

Ball Drop on Wood/Concrete

48 inch ball drop:
Number of bounces until ball stopped _________ Duration of time ball was bouncing _________

24 inch ball drop:
Number of bounces until ball stopped _________ Duration of time ball was bouncing _________
QUESTIONS:

1. Which surface produced the greater number of bounces? _______________________________________
   Why? _______________________________________
   _______________________________________

2. Using the worksheet, compare the number of bounces from 48 and 24 inches. Did it bounce twice as much from 48 inches as it did from 24 inches? _______________________________________
   Why or why not? _______________________________________
   _______________________________________

3. Now do the same thing with the times from the digital timer. Did the ball bounce for half the time when dropped from 24 inches as compared to 48 inches? _______________________________________

4. In your opinion, if you dropped the ball from 96 inches would it produce twice the number of bounces as it did from 48 inches? _______________________________________
   What about total time bouncing? _______________________________________
   Why or why not? _______________________________________
   _______________________________________
ADDITIONAL INFO
## SUPPLIES CHECKLIST

### PROVIDED (QUANTITIES):

- Five (5) indoor basketballs
- Five (5) outdoor basketballs
- Five (5) 25’ tape measures
- Five (5) hair dryers
- Five (5) calipers
- Ten (10) protective eyewear
- Five (5) cut ball swatches - indoor
- Five (5) cut ball swatches - outdoor
- Five (5) digital timers
- Two (2) balls of string (100 feet)
- Five (5) rolls of masking tape
- One thousand (1000) craft sticks
- One hundred (100) plastic spoons
- Five hundred (500) rubber bands
- Two (2) ball bag
- One (1) ball pump
- One (1) set of inflation needles
- One (1) STEM Basketball manual
SCIENCE OF BASKETBALL - MODULE 2.0:

CCSS.ELA-LITERACY.RI.3.3
Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

CCSS.ELA-LITERACY.SL.4.1
Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others’ ideas and expressing their own clearly.

CCSS.ELA-LITERACY.SL.4.1.B
Follow agreed-upon rules for discussions and carry out assigned roles.

CCSS.MATH.CONTENT.4.OA.C.5
Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.
STEM Sports is dedicated to combining scientific learning and sports to help students develop critical-thinking skills that may be applied throughout the rest of their lives. Our team is committed to the educational enrichment of today’s youth. These programs are written by the most knowledgeable people in education and sport. The kit and curriculum are designed to have a long shelf-life and are flexible to be administered in classrooms, during after-school programs, and camps. The curriculum is also scalable and provides expandability for elementary, middle, and even high school grade levels.

For general inquiries or questions regarding the program, please contact:

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