Sports Philanthropy Webinar

EP 4

Engaging Students with STEM

STEM sports
science • technology
engineering • math • sports

Join Jeff Golner, STEM Sports, to learn how your organization can offer five free STEM lessons involving basketball, football, soccer and volleyball, allowing students to continue their education at home.

April 6, 2020 **11 ET/ 10 CT/ 9 MT/ 8 PT AM**

SPN is hosting special free webinars every M,W,F to provide insight and growth opportunities .

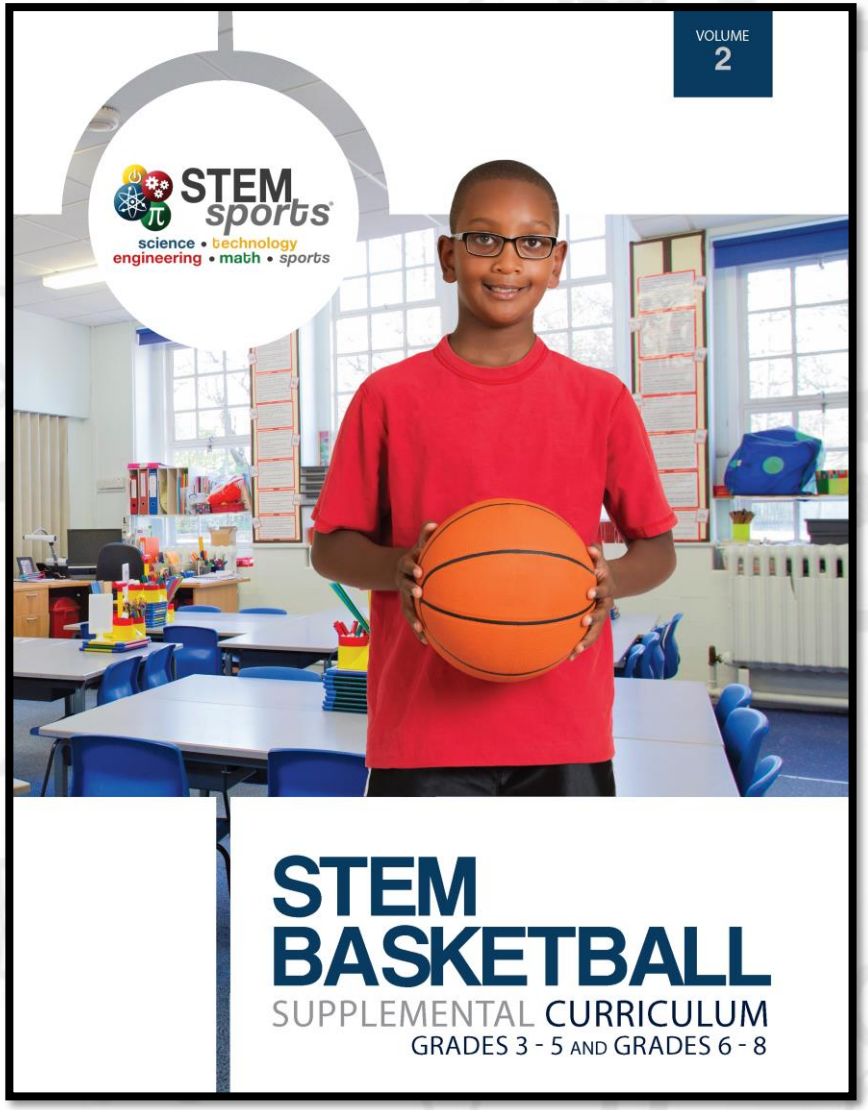
www.SportsPhilanthropyNetwork.com/Webinars

Follow us at:

STEMSportsUSA

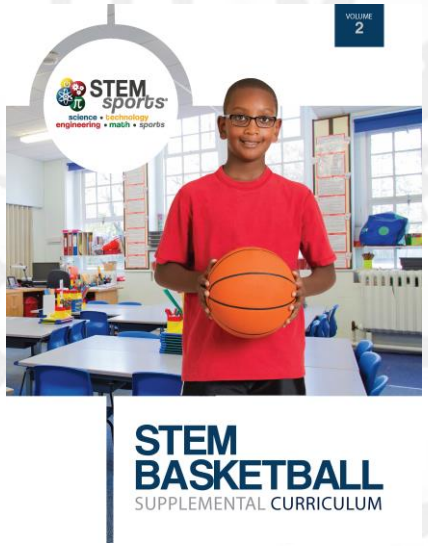
About STEM Sports®

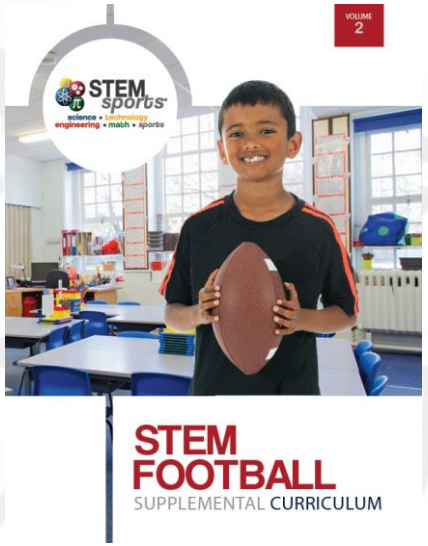
STEM Sports® provides turnkey K-8 supplemental curriculum that uses sports as the real-life application to drive STEM-based learning in classrooms, after-school programs and camps.

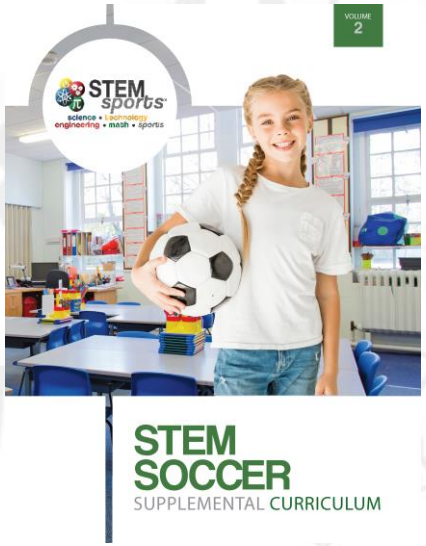


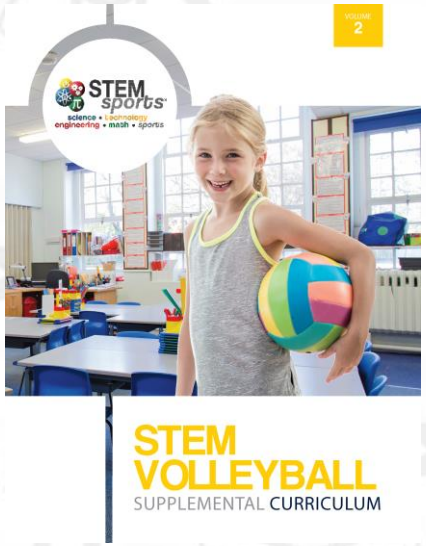
About STEM Sports®

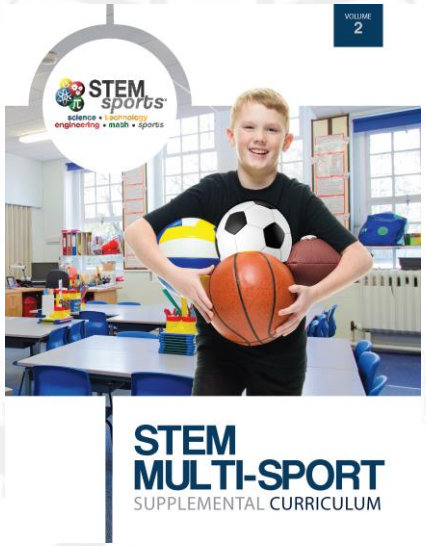
- Began in 2016 after a successful launch of STEM BMX for USA BMX
- STEM Volleyball and STEM Basketball followed
- STEM Soccer, STEM Football, and STEM Multi-Sport launched in 2017
- In August 2018, STEM Sports® received the service mark/trademark/supplemental register from the United States Patent and Trademark Office
- To begin 2019, STEM Sports® and Skyhawks Sports Academy, LLC began an exclusive licensing agreement whereby Skyhawks' STEM Sports® camps and programs are offered
- In November 2019, STEM Sports® went international by partnering with the not-for-profit entity TIBU in Casablanca, Morocco whereby TIBU became an authorized reseller of STEM Sports® curriculum
- STEM Sports® curriculum is in schools, after-schools or camp programs in 47 U.S. states
- As of January 2020, STEM Sports® curriculum is being piloted in Japan, Australia, Egypt, Saudi Arabia and other countries are to follow
- STEM Golf, STEM Hockey, STEM Lacrosse, STEM Tennis, as well as STEM Baseball and STEM Softball along with STEM Multi-Sport for K-2, will be introduced in 2020











TIME

Module 1.1

GRADES 3-5

Basketball Measurements

Concept
Math: Area and Perimeter

Objective
Students will measure the area and perimeter of a polygon by using a square tile and a tape measure (not a ruler). Students will calculate the perimeter and area of a polygon by using a formula and dimension (either measured or given).

Time
(1) 60-minute session

Standards

Common Core State Standards Connections

CCSS.MATH.CONTENT.3.MD.C.6
Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).

CCSS.MATH.CONTENT.3.MD.C.7.A
Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.

CCSS.MATH.CONTENT.3.MD.D.8
Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

CCSS.MATH.CONTENT.4.MD.A.3
Apply the area and perimeter formulas for rectangles in real world and mathematical problems. For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.

National Standards for K - 12 Physical Education

Standard 4: The physically literate individual exhibits responsible personal and social behavior that respects self and others.

STEM sports

Each STEM Sports® teacher's manual contain eight (8) robust supplemental curriculum lessons or modules that provide a minimum of 16 hours learning time.

← Within each module, the time needed is clearly indicated.

STANDARDS

Each curriculum has eight lessons aligned with either the Next Generation Science Standards (NGSS) and/or Common Core State Standards (CCSS) and/or National Standards for K-12 Physical Education.

Module 8.1

GRADES 3-5

Properties of a Football and Foam Football

Concept
Science: Properties of Matter

Objective
Students will divide a football into equal areas by using a diagram. Students will explain how the properties of a football, including shape, affect the football's behavior

Time
(1) 90-minute session

Standards

Common Core State Standards Connections

CCSS.MATH.CONTENT.3.G.A.2
Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

Next Generation Science Standards Connections

5-PS1-3. Make observations and measurements to identify materials based on their properties.
Background: The shape of a football is a "prolate spheroid," which is unique as it allows the object to spin in a spiral motion when thrown properly. The shape of a football also lends itself to some irregular bounces when it hits the ground. The first footballs were shaped after a pig's inflated bladder. Footballs, however, have continued to be shaped in prolate spheroids, which have made them easier to carry and throw.

The developers of EA Sports' video game Madden NFL have spent hours in offices, hallways, and even outside on lawns, dropping, bouncing and rolling footballs to record the results. If you throw a spherical object in the air, you can surmise where it's going to go. However, if you throw a football in the air and it lands on the ground, there is no telling how many ways it can go.

National Standards for K - 12 Physical Education

Standard 1: The physically literate individual demonstrates competency in a variety of motor skills and movement patterns.

Standard 4: The physically literate individual exhibits responsible personal and social behavior that respects self and others.

Supplies Provided
Worksheets, Footballs, Foam Footballs, Scale and Tape Measures

Please email Info@STEMSports.com to access Worksheet Keys.

Materials Needed
Pencils

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SUPPLIES

STEM Sports® turnkey kits come equipped with all of the relevant sports equipment along with the necessary science supplies and teacher manual.

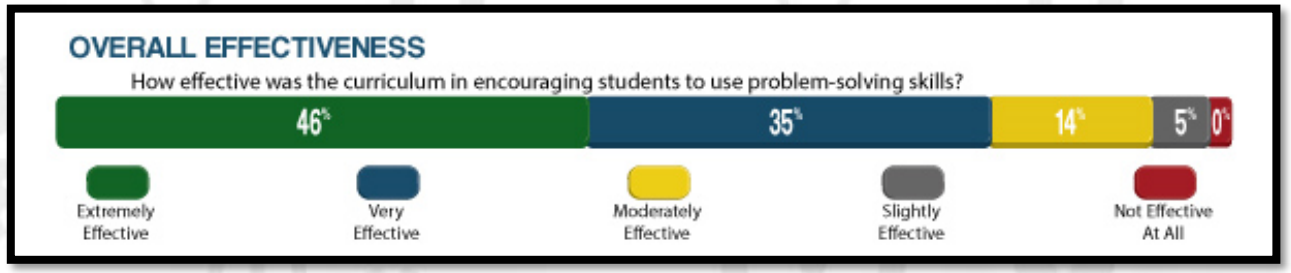
Teacher manuals are available to purchase alone and/or as an individual product.

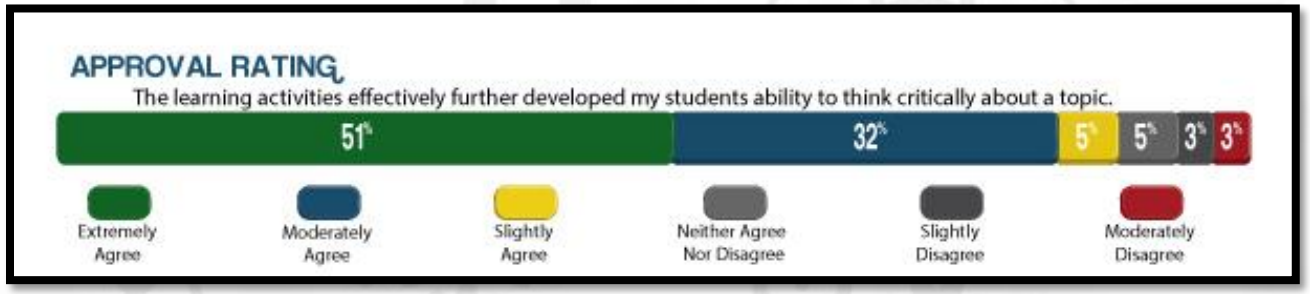
Kits with just the teacher manual and science supplies and without sports equipment are now available as well.

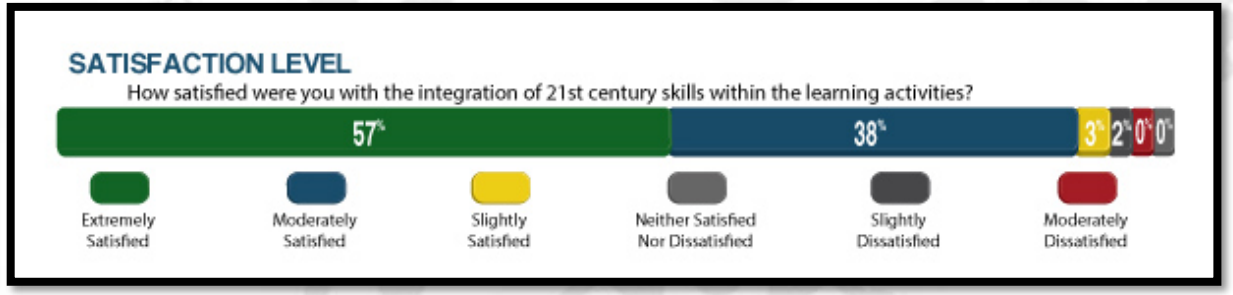
RESULTS

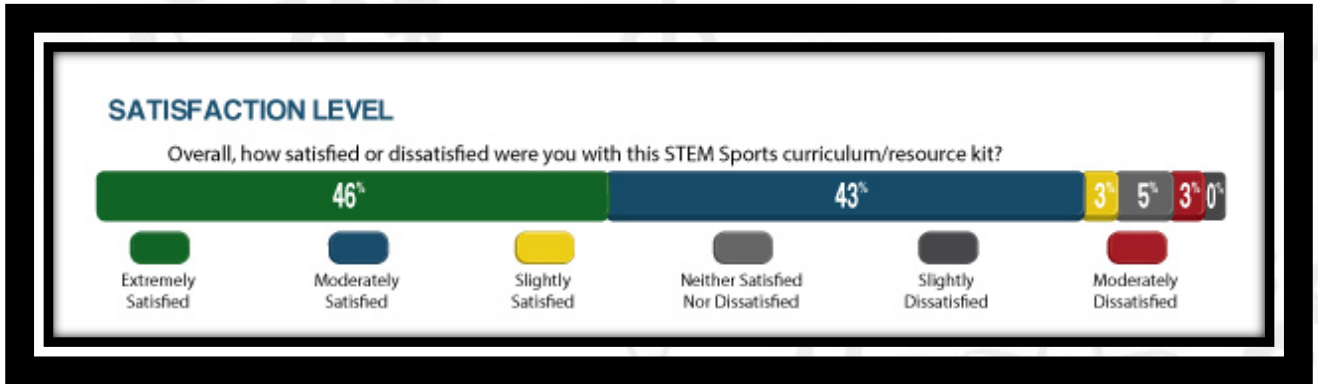
Students will develop 21st-century skills such as critical thinking, collaboration, creative problem-solving, and leadership.

STEM Sports® curriculum survey results were accumulated from January 25, 2019 through December 23, 2019 and are comprised from 37 individual teachers/administers across the United States. For more survey results, click HERE.









GRADES – Who is this for?

Contents
Grades 3-5

Contents
Grades 6-8

Each teacher manual has 3rd to 5th grade lessons and lessons for 6th to 8th grade students.

"Capstone" Project (for 6th to 8th grade students) to commensurate student's knowledge of each curriculum.

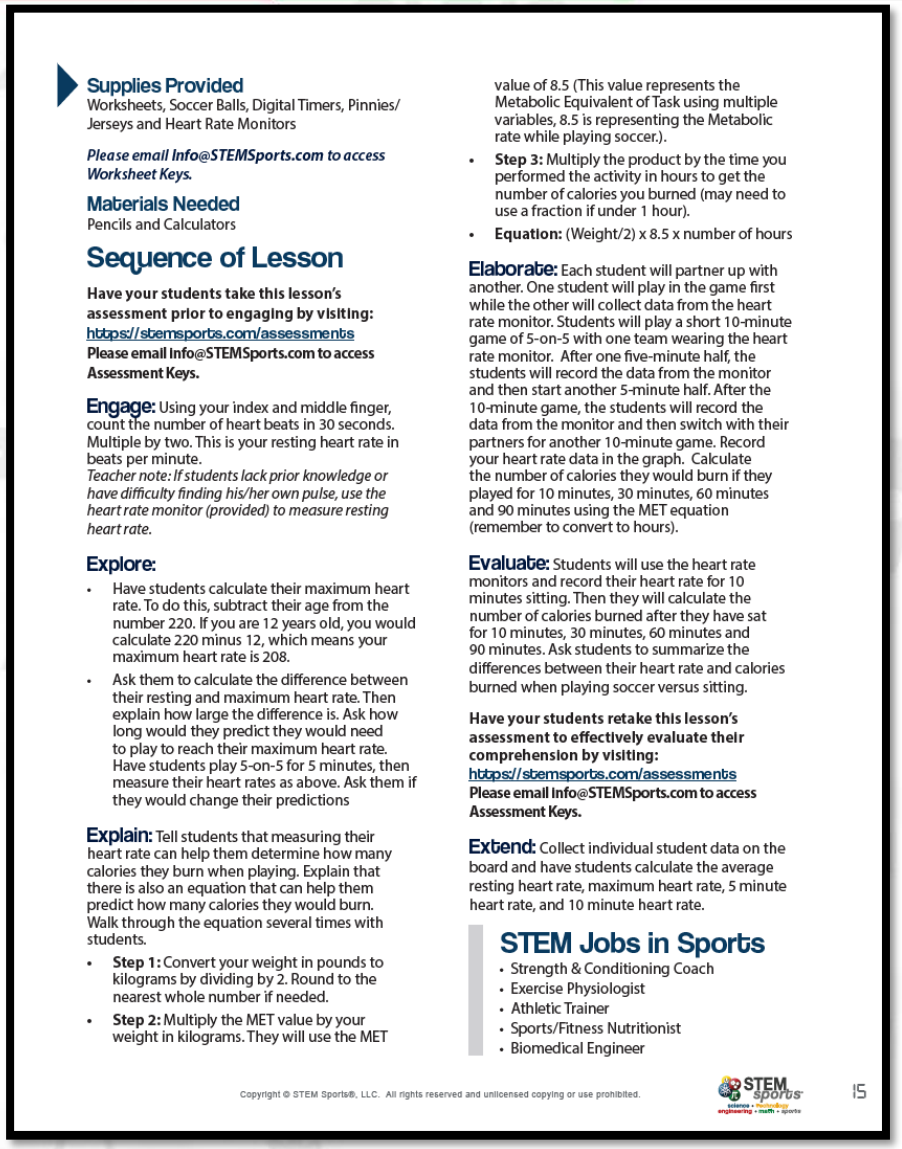
A Multi-Sport for K-2 students will launch in 2020 Q1.

Who teaches the curriculum?

Using the gold standard for science curriculum, the 5E instructional model is used in every module: Engage, Explore, Explain, Elaborate and Evaluate. STEM Sports® even added a sixth sequence: Extend.

This sequence of lesson methodology abides by science and STEM teacher's instruction procedures which also creates great ease for PE teachers, sports coaches, and volunteers. Even students for whom the curriculum is designed for can lead the modules for their fellow students.

After all, STEM skills are all about Leadership, Problem Solving, Critical Thinking and Collaboration.



Supplies Provided
Worksheets, Soccer Balls, Digital Timers, Pinnies/ Jerseys and Heart Rate Monitors

Please email Info@STEMSports.com to access Worksheet Keys.

Materials Needed
Pencils and Calculators

Sequence of Lesson

Have your students take this lesson's assessment prior to engaging by visiting: https://stemsports.com/assessments
Please email Info@STEMSports.com to access Assessment Keys.

Engage: Using your index and middle finger, count the number of heart beats in 30 seconds. Multiple by two. This is your resting heart rate in beats per minute.
Teacher note: If students lack prior knowledge or have difficulty finding his/her own pulse, use the heart rate monitor (provided) to measure resting heart rate.

Explore:

- Have students calculate their maximum heart rate. To do this, subtract their age from the number 220. If you are 12 years old, you would calculate 220 minus 12, which means your maximum heart rate is 208.
- Ask them to calculate the difference between their resting and maximum heart rate. Then explain how large the difference is. Ask how long would they predict they would need to play to reach their maximum heart rate. Have students play 5-on-5 for 5 minutes, then measure their heart rates as above. Ask them if they would change their predictions

Explain: Tell students that measuring their heart rate can help them determine how many calories they burn when playing. Explain that there is also an equation that can help them predict how many calories they would burn. Walk through the equation several times with students.

- **Step 1:** Convert your weight in pounds to kilograms by dividing by 2. Round to the nearest whole number if needed.
- **Step 2:** Multiply the MET value by your weight in kilograms. They will use the MET value of 8.5 (This value represents the Metabolic Equivalent of Task using multiple variables, 8.5 is representing the Metabolic rate while playing soccer.).
- **Step 3:** Multiply the product by the time you performed the activity in hours to get the number of calories you burned (may need to use a fraction if under 1 hour).
- **Equation:** (Weight/2) x 8.5 x number of hours

Elaborate: Each student will partner up with another. One student will play in the game first while the other will collect data from the heart rate monitor. Students will play a short 10-minute game of 5-on-5 with one team wearing the heart rate monitor. After one five-minute half, the students will record the data from the monitor and then start another 5-minute half. After the 10-minute game, the students will record the data from the monitor and then switch with their partners for another 10-minute game. Record your heart rate data in the graph. Calculate the number of calories they would burn if they played for 10 minutes, 30 minutes, 60 minutes and 90 minutes using the MET equation (remember to convert to hours).

Evaluate: Students will use the heart rate monitors and record their heart rate for 10 minutes sitting. Then they will calculate the number of calories burned after they have sat for 10 minutes, 30 minutes, 60 minutes and 90 minutes. Ask students to summarize the differences between their heart rate and calories burned when playing soccer versus sitting.

Have your students retake this lesson's assessment to effectively evaluate their comprehension by visiting: https://stemsports.com/assessments
Please email Info@STEMSports.com to access Assessment Keys.

Extend: Collect individual student data on the board and have students calculate the average resting heart rate, maximum heart rate, 5 minute heart rate, and 10 minute heart rate.

STEM Jobs in Sports

- Strength & Conditioning Coach
- Exercise Physiologist
- Athletic Trainer
- Sports/Fitness Nutritionist
- Biomedical Engineer

JOBS

Supplies Provided
Worksheets and Basketballs

Please email Info@STEMSports.com to access Worksheet Keys.

Materials Needed
Labels of Multiple Foods, Calculators and Pencils

Sequence of Lesson

Have your students take this lesson's assessment prior to engaging by visiting: https://stemsports.com/assessments Please email Info@STEMSports.com to access Assessment Key.

Engage: Ask students to consider: Why do they get hungry faster than normal after they play sports for a long time?

Explore: Have students look at the labels of multiple after-sports foods and drinks, such as coconut water, granola bars, etc. Tell them that kids burn about 200 calories per hour playing basketball. Have them calculate how many coconut waters they need to drink if they play for two hours.

Explain: Explain how the body burns calories by using sugar to make energy. We need our energy in to equal our equal out. Explain that we use energy all the time to keep our bodies warm and breathe, but when we are playing sports like basketball, we are burning more energy. Explain that we can calculate how much energy we burn using multiplication and division. For younger students, walk through the steps with them for LeBron James (he weighs 250 pounds) playing for 30 minutes . Ask students if they can predict if they will use more or less energy than LeBron James to play basketball.

- **Step 1:** Convert your weight in pounds to kilograms by dividing by 2. Round to the nearest whole number if needed.
- **Step 2:** Multiply the MET value by your weight in kilograms. They will use the MET value of 7.0.
- **Step 3:** Multiply the product by the time you performed the activity in hours to get the number of calories you burned. (May need to use a fraction if under 1 hour).
- **Equation:** (Weight/2) x 7 x Number of hours.

Elaborate: Have students play for 15 minutes. They will then calculate the calories they burned during the time they played basketball. Using the worksheet, have students complete the calculation.

Evaluate: Ask students to predict how much they will burn if they play for 30 minutes, 1 hour?

Have your students retake this lesson's assessment to effectively evaluate their comprehension by visiting: https://stemsports.com/assessments Please email Info@STEMSports.com to access Assessment Key.

Extend: Students can work backwards and calculate how long it would take to burn 450 calories.

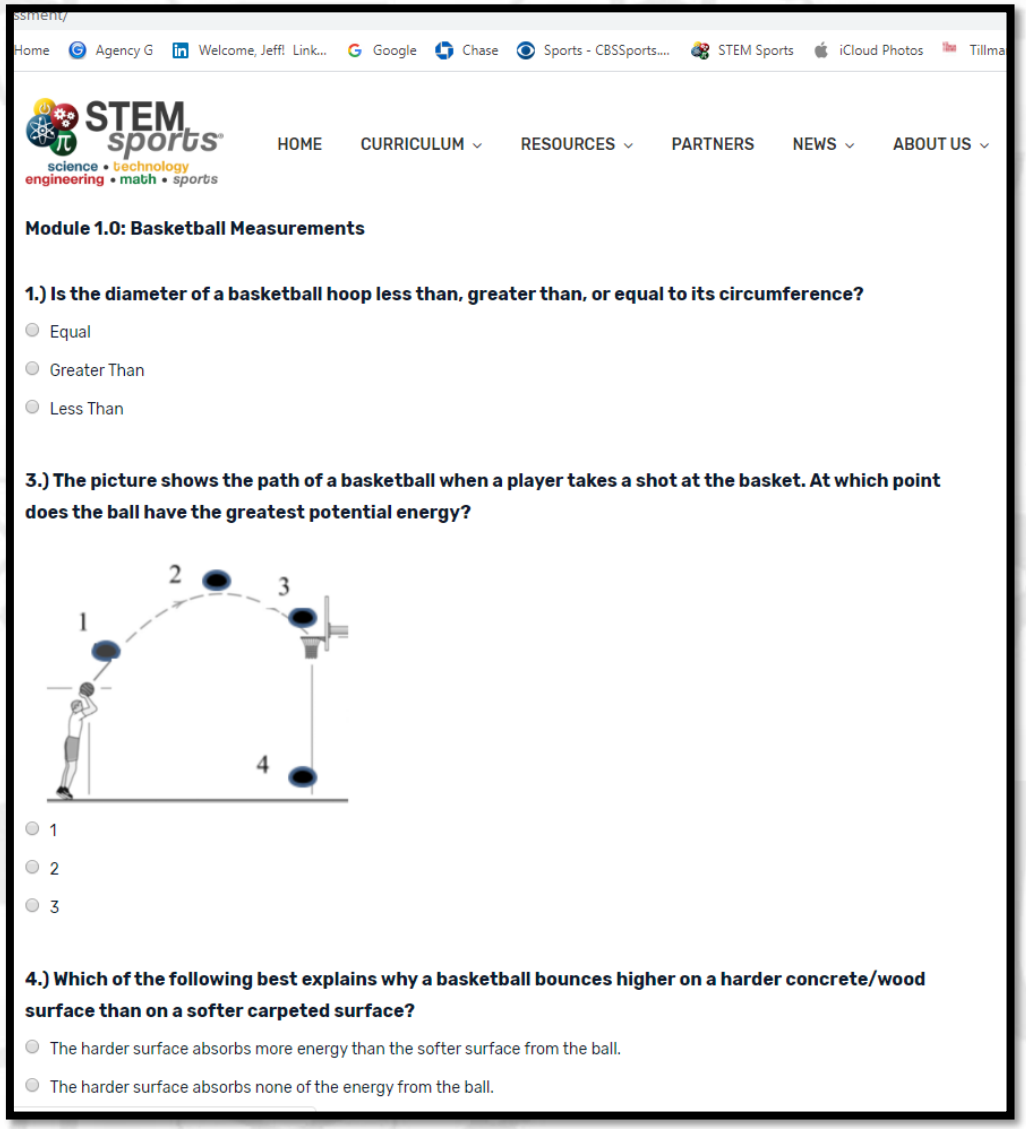
STEM Jobs in Sports
- Team Doctor
- Nutritionist
- Athletic Trainer
- Dietitian
- Strength and Conditioning Coach

At STEM Sports®, we realize the importance and purpose of STEM academia: to help young students obtain important science, technology, engineering and math skills so that when they join the workforce, they are ready and prepared. Moreover, by offering these important STEM skills, students can also see career paths at an earlier age so that their education is geared for their long term success.

In each module, a list of STEM jobs within or touching the sports industry are offered. This enables teachers and curriculum administers the opportunity to have robust classroom discussions about jobs that some students have yet to realize.

ASSESSMENTS

Each curriculum and every module has a corresponding student assessment. As part of the sequence of the lesson, students are to take the assessment before and after the lesson to better evaluate their comprehension level. Teachers/administers will receive instant results once the digital assessment is completed.



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Module 1.0: Basketball Measurements

1.) Is the diameter of a basketball hoop less than, greater than, or equal to its circumference?

- Equal
- Greater Than
- Less Than

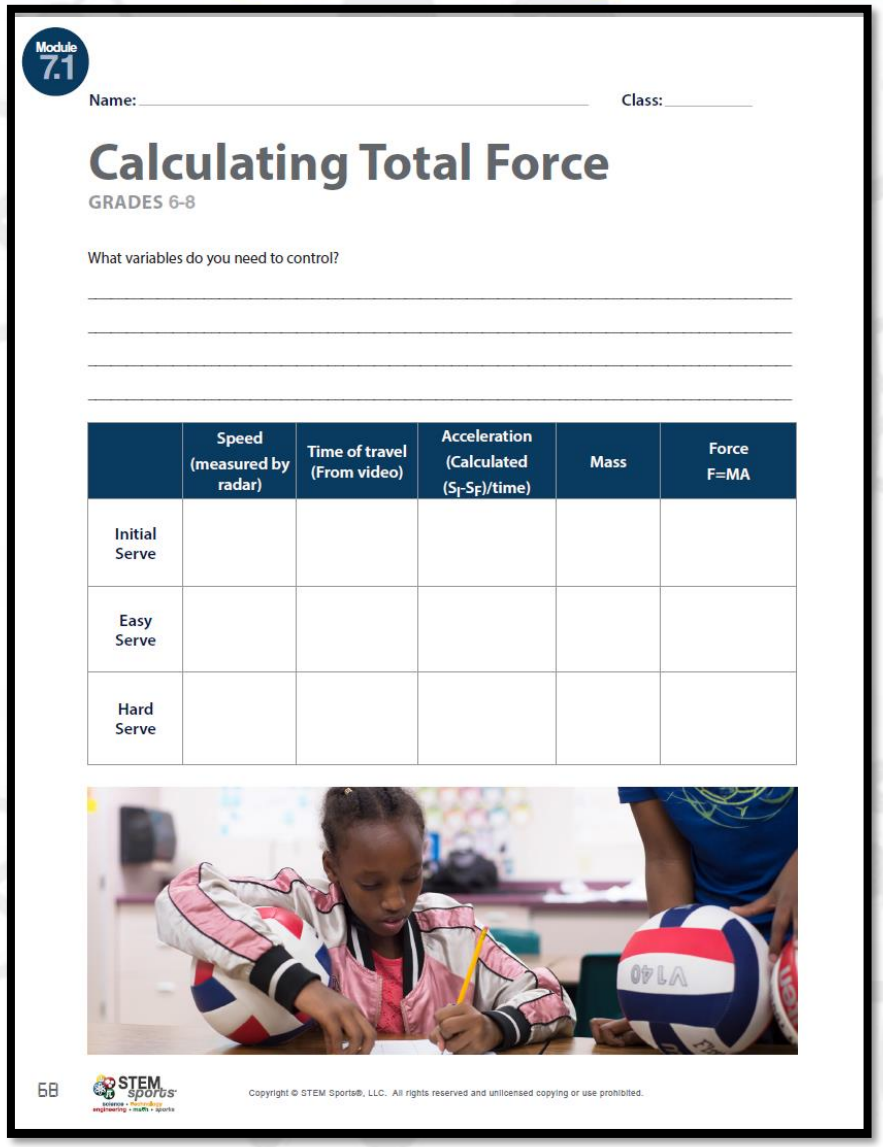
3.) The picture shows the path of a basketball when a player takes a shot at the basket. At which point does the ball have the greatest potential energy?

- 1
- 2
- 3

4.) Which of the following best explains why a basketball bounces higher on a harder concrete/wood surface than on a softer carpeted surface?

- The harder surface absorbs more energy than the softer surface from the ball.
- The harder surface absorbs none of the energy from the ball.

WORKSHEETS



Module 7.1

Name: _____ Class: _____

Calculating Total Force

GRADES 6-8

What variables do you need to control?

_____

_____

_____

_____

	Speed (measured by radar)	Time of travel (From video)	Acceleration (Calculated (S_I-S_F)/time)	Mass	Force F=MA
Initial Serve					
Easy Serve					
Hard Serve					

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Ready-to-use worksheets are applicable to almost every lesson of every module. These worksheets are provided within the teacher manual and are designed for open-ended responses as well as for rigorous data collection. Furthermore, they assist in evaluating the student's comprehension level of the standardized lessons.

Engineering Design Process - EDP

The Engineering Design Process (EDP) is a key element of any STEM curriculum and is woven into each STEM Sports® supplemental curriculum.

Supplies Provided

Worksheets, Soccer Balls, String, Tape, Bells and Tent Pegs

Please email Info@STEMSports.com to access Worksheet Keys.

Materials Needed

Pencils

Sequence of Lesson

Have your students take this lesson's assessment prior to engaging by visiting: https://stemsports.com/assessments Please email Info@STEMSports.com to access Assessment Keys.

Engage: Play the few seconds of first video under Goal-Line Technology at www.STEMSports.com by clicking "Resources", then "STEM Soccer". Ask students if a goal would be given here or not. Have students discuss with their groups. Ask them if they think it is fair to use technology to determine if it was a goal. Why or why not? Show them the rest of the video.

Explore: Play the second video under Goal-Line Technology at www.STEMSports.com by clicking "Resources", then STEM Soccer. Ask students to draw a diagram of the current technology at the World Cup.

Explain: Tell students that technology can be designed using the Engineering Design Process. Discuss Engineering Design Process steps.

Engineering Design Process

Explain that sometimes we need to engineer a simpler product for different uses. For example, we may not use the system developed for the World Cup in a youth community league, but it still might be fair if the youth league had a device to determine if the entire ball crosses the line. Their problem is that the current technology is too expensive.

Elaborate: Students need to design a low tech version of goal-line technology. Students will brainstorm, prototype, and test the prototype. Use the engineering design sheet to help guide them through the process.

Evaluate: Students should present their designs to the class with evidence to support that it is successful.

Have your students retake this lesson's assessment to effectively evaluate their comprehension by visiting: https://stemsports.com/assessments Please email Info@STEMSports.com to access Assessment Keys.

Extend: If you have other materials available, allow students to have an open design challenge. Students need to use data to redesign and justify their design changes in writing.

STEM Jobs in Sports

- Computer/Application Coder (App)
- Video Producer
- Patent Agent
- Computer Engineer
- Stadium/Arena: Quality Control Coordinator

Fun Facts

Perhaps one of the most famous goal-line related incidents came in 2010 in the knockout stages of the FIFA World Cup with Germany and England. Just before halftime, Frank Lampard of England shot the ball and it hit the underside of the crossbar, resulting in the ball fully crossing the goal line but bouncing back into the field of play due to backspin. Neither the referee nor his assistant could award the goal. England went on to lose to Germany in that game 4-1.

MINDFULNESS

Mindfulness may not be the first thing one thinks about regarding STEM Sports®. However, mindfulness is essential to fully understanding the design and benefits of the STEM Sports® curricula by way of the following:

- Approximately 85% of STEM jobs anticipated for the year 2030 have yet to be invented.
- Moreover, within the next 10 years or so, 80% of all jobs will be STEM related.

The STEM Sports® curricula distinctly blends STEM content areas through hands-on/active play and sports. Active play provides a mechanism to teach STEM concepts; therefore, learning is integrated, engaging and meaningful as participants are exposed to STEM applications through real world experiences.

Teachers of the curricula should be mindful of the fact STEM Sports® curricula are:

- Collaborative in nature, ensuring peer-to-peer learning opportunities
- Inquiry-based, allowing learners to discover information for themselves
- Designed for problem-solving, an essential lifelong skill
- Hands-on, engaging all types of learners
- Student-led, encouraging ownership of learning
- Active, promoting physical activity and wellbeing

Participants of the curricula should be mindful of the fact STEM Sports® curricula are:

- Introduction to STEM concepts, facilitating comfort with STEM content areas
- Blending play and sport in an environment that is engaging, fun, and applicable to life outside the classroom
- Designed for all ensuring success for all participants – students do not have to be athletic or excel at science to accomplish curricula tasks
- Applicable to the real world where learning is meaningful for all participants

In sum, stakeholders should be mindful of all the STEM Sports® curricula have to offer. The unique design of the STEM Sports® curricula is essential to maximize learning and the understanding of STEM concepts in sports and life applications.

The mental health of both teachers and students alike should not be overlooked during any aspect of the education process. STEM Sports® recognizes this and establishes that mindfulness matters when tackling our curriculum. The need and importance of the double play of STEM & Sports is established at the beginning of each curriculum.

STEM Sports® Curriculum Details

For slides 16 through 40, review the Tables of Contents for each curriculum, based on grade differentiation, along with Supplies highlights.

STEM Basketball – Grades 3-5

Module 1.1
The Measurements of Basketball

Objective
Students will measure the area and perimeter of a polygon by using a square tile and a tape measure. Students will calculate the perimeter and area of a polygon by using a formula and dimension (either measured or given).

Concept
Math: Area and Perimeter

Time
(1) 60-minute session

Module 2.1
Forces in Basketball

Objective
Students will conduct a controlled experiment to determine the change in motion by measuring the number of bounces and the height of the first bounce. Students will predict how gravity/motion will affect/change the ball if it is dropped at a higher or lower height.

Concept
Science: Motion and Gravity

Time
(2) 45-minute sessions

Module 3.1
Understanding Basketball

Objective
Students will explain why balls behave differently by using observations about the solids and gases that make up the balls. Students will make observations about texture, ability to stretch, and state of matter of materials by recording information in a data table. Students will explain there is air inside the ball by comparing an empty ball and a full ball.

Concept
Science: States of Matter, Observations

Time
(2) 45-minute sessions

Module 4.1
Motion and Basketballs

Objective
Students will round whole numbers from the tenth place. Students will divide two whole numbers to determine the speed of a basketball. Students will explain speed as a division problem between distance and time.

Concept
Science: Measuring Speed
Math: Division and Real World Problems

Time
(2) 45-minute sessions

STEM Basketball – Grades 3-5

Module 5.1
Engineering Design Challenge

Objective
Students will design a device that increases the motion of an object by conducting a controlled test. Students will conduct a controlled test on their design by taking measurements and recording observations.

Concept
Motion and Engineering for Accuracy

Time
(2) 45-minute sessions

Module 6.1
Calculating Calories

Objective
Students will calculate calories burned during gameplay by using multiplication and division. Students will predict the calories they will burn by doubling numbers.

Concept
Math: Multiplication and Division

Time
(1) 60-minute session

Module 7.2
Shot Tracking

Objective
Students will compare fractions based on their free throw accuracy by using the greater than and less than symbols.

Concept
Math: Fractions

Time
(1) 60-minute session

Module 8.1
Advancements in Shoe Technology

Objective
Students will make detailed observations by using their senses and measurements to make inferences about changes in technology.

Concept
Science: Observation

Time
(2) 45-minute sessions

STEM Basketball – Grades 6-8

Module 1.1
Basketball Measurements

Objective
Students will use actual data to determine the scale sizes of a basketball court by using proportional relationships.

Concept
Math: Propositions

Time
(2) 50-minute blocks

Module 2.1
Science of Basketball

Objective
Students will compare the forces acting and reacting on a basketball by using data from a controlled experiment. Students will explain how Newton's Third Law is demonstrated in dribbling a basketball.

Concept
Science: Physics

Time
(3) 50-minute blocks

Module 3.1
Understanding Basketball

Objective
Students will describe how temperature changes the properties of the basketball by drawing a diagram of the molecular motion inside the ball. Students will describe how temperature changes the properties of the basketball by drawing a diagram of the molecular motion of the solid ball material.

Concept
Science: Molecules and Heat

Time
(2) 50-minute blocks

Module 4.1
Velocity and Acceleration

Objective
Students will calculate the force used on a basketball in different pass types by using Newton's Second Law. Students will describe the materials of a basketball by using the physical and chemical properties.

Concept
Science: Physics and Chemistry

Time
(2) 50-minute blocks

STEM Basketball – Grades 6-8

Module 5.1
Engineering Design Challenge

Objective
Students will design and build a mechanical shooting device (aka catapult) by using the Engineering Design Process. Students will test and redesign their prototype by using Newton's Second Law to determine the change in force.

Concept
Engineering and Science: Physics

Time
(3) 50-minute blocks

Module 6.1
Calculating Calories

Objective
Students will explain how food is converted to energy (kcal) through cellular respiration. Students will develop an equation for calories burned during activity by using letters to represent variable for the equation.

Concept
Science and Math: Biology and Equations

Time
(1) 50-minute block

Module 7.2
Shot Tracking with Technology

Objective
Students will use data collected to make a claim using evidence from technology by interpreting graphs.

Concept
Science and Math: Process of Science, Statistics

Time
(2) 50-minute blocks

Module 8.1
Advancements in Shoe Technology

Objective
Students will use qualitative data to evaluate and improve shoe technology by using the Engineering Design Process.

Concept
Engineering

Time
(2) 50-minute blocks

STEM Basketball

- Multiples of 18 different products in the kit
- Long shelf-lives
- Features: 10 basketballs and five hair dryers

How to receive STEM Sports® Curriculum

Visit

www.STEMSports.com/Samples

Fill out a brief form and request the lesson you desire.

You'll also receive a free, non-sports specific lesson called *Playing with Precision.*