We greatly appreciate your purchase of our STEM Football 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 Football is not the only program we have available. Check out www.STEMSports.com for additional sports such as BMX, volleyball, soccer, basketball, 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 Football manual is designed to deliver content for 16+ hours of instruction for 12 students (6 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 football 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.
# Football Curriculum

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MODULES
Module 2.0

TECHNOLOGICAL ADVANCEMENTS AND IMPROVED QUARTERBACK PLAY

CONCEPT: Improved quarterback play and technological advancements

OBJECTIVE: Students will understand the advantages of technological advancements in gloves and how they have impacted the game overall and quarterback efficiency.

ACTIVITY

As with all sports, technological advancements have had a great impact on the game of football. Take basketball and the advancements in shoes, or soccer and the advancements made in cleats. In football, there are a handful of advancements that have impacted game-play, like the evolution of the helmet, which we will take a look at later. In this module, however, we will talk about advancements relating to catching/intercepting the football and how different improvements have impacted the game.

It was in the late 1970s and early 80s, wide receivers in the NFL began using a thick gummy-like paste on their hands, called stickum. Stickum, along with all other adhesives were banned by the NFL in 1981 which sparked equipment providers like Nike to start producing gloves that increased grip.

The early editions of the gloves were made with a neoprene material – a synthetic rubber material – that people use when scuba-diving. However, in cold-weather football games, it would cause receiver’s hands to sweat and in sub-freezing temperatures would then result in frozen hands.

The chart to the right indicates that while interception rates (red line) have decreased, completion percentages (blue line) have steadily improved. This, along with several other factors, can be attributed to glove technology giving receivers an advantage in ball-catching.

1. Before you begin the activity, discuss among your classmates what factors went into the peaks and valleys in the above chart. Why do you think that?

2. Do you think catching the ball with or without gloves will be easier? Why do you think that?
CONCEPT: Improved quarterback play and technological advancements

OBJECTIVE: Students will understand the advantages of technological advancements in gloves and how they have impacted the game overall and quarterback efficiency.

Break into groups of two (2).

- Between you and your partner, can either of you pick up the football using just one (1) hand?
- Spend the next 10 minutes playing catch with a football while neither of you wear gloves.
- Next, have one partner put on gloves and continue to play catch for 5 minutes. After 5 minutes, switch, and play catch for another 5 minutes.
- Can you now pick up the football with one gloved hand? Why do you think that is?

QUESTIONS:
1. Do you think catching the football was easier or harder after you put the gloves on?
2. Did your ability to catch the football improve?
3. Do you feel like players have an advantage when they wear gloves while playing?
4. What are some arguments you could make against players wearing gloves?
5. Sometimes, in cold weather, quarterbacks wear gloves on their throwing hand. What advantages/disadvantages does the quarterback have?
6. What other on-field football equipment improvements have had major impact on the game?

OUTCOME: Students will experience first-hand how technological advancements have been made to improve game-play.

STANDARDS: See appendix on page 25 to reference NGSS and CCSS connections.

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FUN FACTS
Gloves are most often made of a combination of polyester, silicone, and neoprene, all of which help with catching/gripping a football.
Module 2.0
Worksheet

Technological Advancements
and Improved Quarterback Play

Discussion:
1. Before you begin the activity, discuss with your classmates what factors went into the peaks and valleys on the given chart. Why do you think that?

2. Do you think catching the ball with or without gloves will be easier? Why do you think that?

Activity

Between you and your partner, see if either of you can pick up the football with just one (1) hand

Partner 1 (Yes/No?) ________  Partner 2 (Yes/No?) ________

With a partner, spend 10 minutes playing catch with the football.

After five (5) minutes, one partner should put the gloves on, and then continue to play catch. After five (5) minutes, switch the gloves, and play catch for another five (5) minutes.

Between you and your partner, see if either of you can pick up the football with just one (1) gloved hand?

Partner 1 (Yes/No?) ________  Partner 2 (Yes/No?) ________

1. Do you think catching the football was easier or harder after you put gloves on? Why?

2. Did your ability to catch the football improve while wearing gloves?

3. Do you feel like players have an advantage when they wear gloves while playing? Why?

4. What are some arguments you could make against players wearing gloves? Between you and your partner, come up with at least three (3).

5. Sometimes, in cold weather, quarterbacks wear gloves on their throwing hand. What are some of the advantages and disadvantages to quarterbacks doing this? Between you and your partner, come up with at least three (3).

6. What other on-field football equipment improvements has had major impact on the game?
## Supplies Checklist

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Six (6) youth size footballs</td>
<td></td>
</tr>
<tr>
<td>Six (6) foam footballs</td>
<td></td>
</tr>
<tr>
<td>Six (6) pairs of Cutters gloves</td>
<td></td>
</tr>
<tr>
<td>Six (6) digital timers</td>
<td></td>
</tr>
<tr>
<td>Six (6) 25’ tape measures</td>
<td></td>
</tr>
<tr>
<td>Two (2) walkie-talkies</td>
<td></td>
</tr>
<tr>
<td>One (1) headset</td>
<td></td>
</tr>
<tr>
<td>One thousand (1000) craft sticks</td>
<td></td>
</tr>
<tr>
<td>Two (2) disc cones</td>
<td></td>
</tr>
<tr>
<td>One (1) blindfold</td>
<td></td>
</tr>
<tr>
<td>One (1) weight scale</td>
<td></td>
</tr>
<tr>
<td>One (1) ball bag</td>
<td></td>
</tr>
<tr>
<td>One (1) ball pump</td>
<td></td>
</tr>
<tr>
<td>One (1) set of inflation needles</td>
<td></td>
</tr>
<tr>
<td>One (1) STEM Football manual</td>
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TECHNOLOGICAL ADVANCEMENTS AND IMPROVED QUARTERBACK PLAY – MODULE 2.0:

Next Generation Science Standards

5-PS1-3. Make observations and measurements to identify materials based on their properties.

3-PS2-1. Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

3-PS2-2. Make observations and/or measurements of an object’s motion to provide evidence that a pattern can be used to predict future motion.

3-PS3-2. Ask questions to determine cause and effect relationships between two objects not in contact with each other.
APPENDIX

3-PS2-4. Define a simple design problem that can be solved by applying scientific ideas.

3-5.ETS1-1. Define a simple problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost.

3-5.ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5.ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

5.PS1-1. Develop a model to describe that matter is made of particles too small to be seen.

Common Core State Standards Connections:

CCSS.RI.1. Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

CCSS.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.RI.3.8. Describe the logical connection between particular sentences and paragraphs in a text (e.g. comparison, cause/effect, first/second/third in a sequence).

CCSS.RI.5.1. Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.

CCSS.RI.5.2. 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.RI.5.9. Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.

CCSS.W.3.7. Conduct short research projects that build knowledge about a topic.

CCSS.W.3.8. Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.
**APPENDIX**

**CCSS.SL.3.3.** Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

**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.MP.2.** Reason abstractly and quantitatively.

**CCSS.MP.5.** Use appropriate tools strategically.

**CCSS.3.MP.A.2.** Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units.

**CCSS.ELA-LITERACY.L.4.6.** Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal precise actions, emotions, or states of being (e.g., quizzed, whined, stammered) and that are basic to a particular topic (e.g., wildlife, conservation, and endangered when discussing animal preservation).

**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.Math.Content.5.MD.C.5.** Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.

**CCSS.Math.Content.3.MD.A.2.** Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.

**CCSS.W.5.7.** Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.

**CCSS.W.5.8.** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

**CCSS.W.5.9.** Draw evidence from literary or informational texts to support analysis, reflection, and research.

**CCSS.3.OA.** Operations and Algebraic Thinking
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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602.845.0316
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