Evolution of the Lacrosse Stick

The game of lacrosse has changed immensely since its induction in the 17th century. During the earliest days of the game, players built and used their own lacrosse sticks, which were generally made of wood, so durability was not a given by way of today's lacrosse stick that is made of light-weight metal, functioning seamlessly in the hands of today's skilled players. In contrast, the game's first stick was certainly not designed to perform at a high level — it was flimsy/unstable and/or difficult to maneuver during play — the ball often hit the lip of a lacrosse stick's head when passing to a teammate or taking a shot.

Like most sports equipment developed two hundred or more years ago, natural resources were used, such as wood (trees) and animal byproducts (leather, fur, etc.). The first sticks – shaft and head – looked nothing like today's stick that is made from synthetic materials, such as metal (shaft) and plastic (head). The first sticks looked more like a fishing net with plenty of room to catch a fish with the netting, or the head of the stick. Changes to the stick would eventually take place, but not for quite some time…

An important next step in the evolution of the lax stick was manufacturing to ensure durability. In the 1890s, former player Frank Lalley opened a lacrosse stick factory on Cornwall Island in Eastern Ontario, Canada. His operation generated several models of the lacrosse stick, supporting the game's effort to grow

Menominee (Menomini)

Wood, hide

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Winnebago (Nebraska)

Wood, hide thong/babiche

NATIONAL MUSEUM OF THE AMERICAN INDIAN, SMITHSONIAN INSTITUTION (10/2755). PHOTO BY NMAI PHOTO SERVICES.

Anishnaabe (Ojibwa)

Wood, hide

PHOTO COURTESY OF THE CANADIAN MUSEUM OF HISTORY COLLECTION (III-G-359)

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Seneca (Oklahoma) - circa1880-1910

Wood, hide thong/babiche

NATIONAL MUSEUM OF THE AMERICAN INDIAN, SMITHSONIAN INSTITUTION (10/2734). PHOTO BY NMAI PHOTO SERVICES.

The most instrumental change in the history of the game and its equipment came from engineering the two-part lacrosse stick and/or separation and interconnection of the shaft and head.

through its evolution of equipment. Yet the lax head and shaft would continue to evolve to meet players' and coaches' needs and expectations within the next ninety years or so…

By the 1970s, two giants in the lacrosse industry emerged: Brine and STX. The most instrumental change in the history of the game and its equipment came from engineering the two-part lacrosse stick and/or separation and interconnection of the shaft and head. This discovery was momentous for the prototyping and creation of lax sticks for specific positions/players. It also identified designs/brands that failed, and subsequent advancement of companies like Brine and STX.

By the 1990s, Brine and STX were operating on all cylinders, establishing quite the competition between the two companies. In turn, this competition generated outstanding ingenuity, such as the "pinch" design, as opposed to the "straight V molds". This, in addition to lighter, stronger metal shafts, as well as lax heads effectively designed to ensure peak performance at each position.

The lacrosse stick has come a long way since its wooden head and shaft. The modern era has produced not only a piece of equipment that is extremely durable and long-lasting, but one that supports players and their ability to improve. Overall, technological advancements that have enhanced and expanded the game.

Sources:

The Complete Evolution of the Lacrosse Stick - Lacrosse Playground (https://lacrosseplay.wpengine.com/)

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Name: _____ Class: _____

The Lacrosse Stick

GRADES 6-8

1. What were some constraints of the first lacrosse stick? Why do you think participants felt they needed to make a change?

2. How has the structure of the lacrosse shaft and head changed over time? What drove this change?

3. How have the materials of the lacrosse shaft and head changed over time? How do you think the use of natural materials versus synthetic materials impacted play?

4. What was the purpose of this article? Provide evidence from the text to support your claim.

5. Do you think there will be future changes to the game of lacrosse? If so, what changes do you foresee being made and why?

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Name: _____ Class: _____

The Lacrosse Stick

GRADES 6-8

Using the article and classroom discussion, complete the following criteria and constraint table.

Criteria	Constraints

Using the rating system of 1 - 5 (1 = Best; 5 = Worst), have students rate which ball was easiest to release, catch, and control with the lacrosse stick and explain why.

Ball Type	Rate: 1 -5	Reason for rating
Golf Ball		
Ping Pong ball		
Tennis Ball		
Lacrosse Ball		

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Name: _____ Class: _____

The Lacrosse Stick

GRADES 6-8

Based on evidence from the article and your experiment, write a claim and support it with evidence and reasoning, explaining how and why the lacrosse stick controls, releases, and catches each ball type differently.

Claim: How did the evolution of the lacrosse stick - shaft and head - become a design that handles and controls each ball type effectively?

_____

_____

_____

Evidence: Record and reference in words any data that supports your claim.

_____

_____

_____

Reasoning: Explain why your claim is supported by evidence and scientific ideas. Use the ideas in your experiment and understanding of engineering an object for a specific function.

_____

_____

_____

_____

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Module 2.0

Name: _____ Class: _____

Intricacies of a Lacrosse Field

GRADES 6-8

Calculate the following to determine the width of a scaled down lacrosse field.

$$\frac{\text{1.25 inch (¼)}}{\text{5 yards}} = \frac{\text{x inches}}{\text{60 yards}}$$

$$\frac{\text{.5 inches (½)}}{\text{5 yards}} = \frac{\text{x inches}}{\text{60 yards}}$$

$$\frac{\text{.125 inches (⅛)}}{\text{5 yards}} = \frac{\text{x inches}}{\text{60 yards}}$$

Which of the three scales would have a reasonable end width? Why?

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Name: _____ Class: _____

Intricacies of a Lacrosse Field

GRADES 6-8

Calculate the following to determine the length of a scaled down lacrosse field.

$$\frac{.25 \text{ inch } (\frac{1}{4})}{5 \text{ yards}} = \frac{x \text{ inches}}{110 \text{ yards}}$$

$$\frac{.5 \text{ inches } (\frac{1}{2})}{5 \text{ yards}} = \frac{x \text{ inches}}{110 \text{ yards}}$$

$$\frac{.125 \text{ inches } (\frac{1}{8})}{5 \text{ yards}} = \frac{x \text{ inches}}{110 \text{ yards}}$$

Which of the three scales would have a reasonable end length? Why?

Coaches have clipboards that are 8.5 x 11 inches. What scale would you use to ensure the field fits on a single sheet of paper?

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Name: _____ Class: _____

Kinetic Energy in Lacrosse

GRADES 6-8

	Pass 1 = 10 meters			Pass 2 = 10 meters		
Mass of ball: 0.15 kg	Time (s)	Velocity (m/s)	Kinetic Energy (Joules)	Time (s)	Velocity (m/s)	Kinetic Energy (Joules)
Student 1						
Student 2						
Student 3						
Student 4						

	Pass 3 = 10 meters			Pass 4 = 10 meters		
Mass of ball: 0.15 kg	Time (s)	Velocity (m/s)	Kinetic Energy (Joules)	Time (s)	Velocity (m/s)	Kinetic Energy (Joules)
Student 1						
Student 2						
Student 3						
Student 4						

1. What percent of the Kyle Hartzell shot (111 MPH) was your fastest pass/shot? Example: If you threw at 14 M/S / 50 M/S = .28 or 28%. Your fastest pass was only 28% as fast as Kyle Hartzell's shot.

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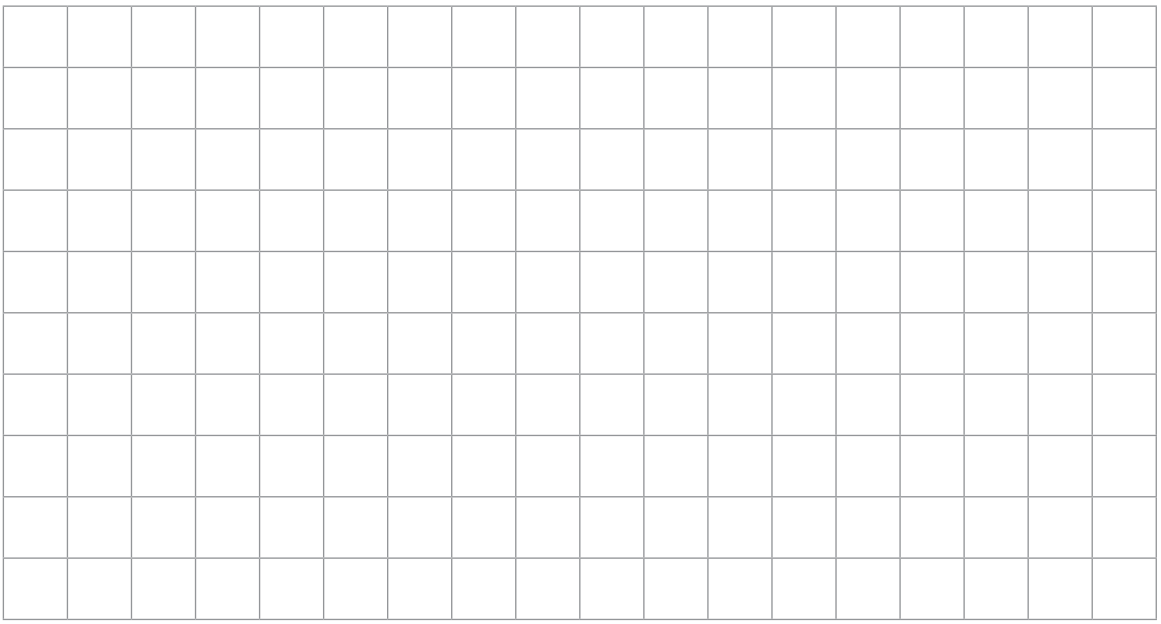
Name: _____ Class: _____

Kinetic Energy in Lacrosse

GRADES 6-8

Graph the kinetic energy vs. your velocity for each throw from slowest to fastest.



2. Based on your data/graph, explain the relationship between velocity and kinetic energy by making a claim about the relationship. Support your claim with evidence and reasoning.

Claim: What is the relationship between velocity and kinetic energy?

Evidence: Record and reference in words any data that supports your claim.

Reasoning: Explain why your claim is supported by evidence and scientific ideas. Use the kinetic energy formula to support you.

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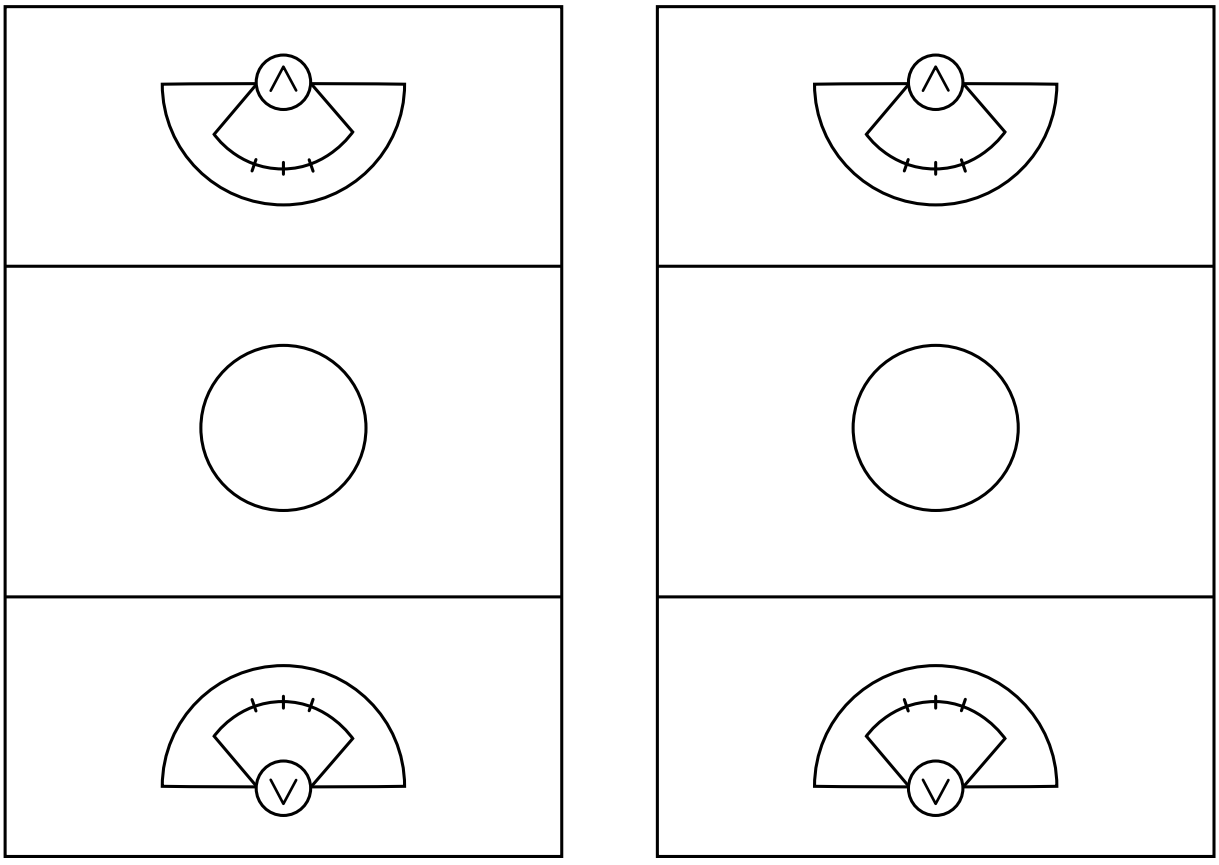
Name: _____ Class: _____

Area of Shooting Spaces

GRADES 6-8

Shooting Triangle	Person 1	Person 2	Person 3	Person 4
Height				
Base				
Area (calculated)				
Number of goals made (out of 10)				

Sketch each group member's shooting triangle. Label each side with the correct measurement and include the area in the center.



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Name: _____ Class: _____

Area of Shooting Spaces

GRADES 6-8

Claim: What is the relationship between the shooting triangle area and number of goals made?

Evidence: Using your data, explain why your claim is supported.

Reasoning: Justify your response.

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Name: _____ Class: _____

Predicting Potential Energy

GRADES 6-8

Point by point Diagram 1

Potential or Kinetic

_____ _____ _____ _____ _____ _____

Height of the ball (potential areas only)

_____ _____ _____ _____ _____ _____

Velocity of the ball (kinetic areas only)

_____ _____ _____ _____ _____ _____

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Predicting Potential Energy

GRADES 6-8

Point by point Diagram 2

Potential or Kinetic

_____ _____ _____ _____ _____ _____

Height of the ball (potential areas only)

_____ _____ _____ _____ _____ _____

Velocity of the ball (kinetic areas only)

_____ _____ _____ _____ _____ _____

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Name: _____ Class: _____

Passing with Accuracy

GRADES 6-8

Record the number of successful passes below from a distance of 5 meters.

O = Completed Pass X = Incomplete Pass

	1	2	3	4	5	6	7	8	9	10	Probability
Trial 1											
Trial 2											
Trial 3											

Testable Question:

_____

_____

Statistical Question:

_____

_____

	Variable 1	Probability	Variable 2	Probability
Trial 1				
Trial 2				
Trial 3				

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Helmet Safety

We see helmets in a large variety of sports, from football to cycling to hockey. Even baseball players wear helmets when they are at bat. In Lacrosse, men wear helmets and women don't. This is the only sport to have such a distinct difference in safety equipment across each gender. So much so, that it is against the rules for women to wear a hard sided helmet in the game. The Center for Disease Control (CDC) tells parents in the Heads-UP Campaign that although there is no concussion-proof helmet, wearing a helmet can protect against head injuries. In their handout on lacrosse helmets, it does note that girls are no different in this reasoning.

What reasoning do the governing organizations have to only require helmets for one gender? One reason may be the rules regarding contact in women's lacrosse: there is less physical contact. However, this does not account for incidents involving sticks hitting a player's head, a ball hitting a player's head, and/or accidents where physical collisions do occur. In fact, research in the early 2000's found that head and face injuries were more common in women at 30%, compared to men's 20% (Gale, 2001). The majority of the women's injuries involve the ball and the majority of the men's injuries involve another player. Clearly, this reason is not well founded in research. Even in non-physical contact sports like baseball and softball require both women and men wear helmets to protect themselves from the ball.

In sum, safety should always be a top priority for all players: men and women. Particularly for a contact sport such as lacrosse. And while the number of participants in contact sports such as hockey and football are not female, protective headgear is still required for those

More than 170,000 kids and teens are treated in an emergency department each year for sports- or recreation-related traumatic brain injuries, including concussions.

women participating. As the game of lacrosse continues to grow, should safety protocols remain the same or change to protect all participants in the future?

Sources:
Diamond PT, Gale SD. Head injuries in men's and women's lacrosse: a 10 year analysis of the NEISS database. National Electronic Injury Surveillance System. Brain Inj. 2001 Jun;15(6):537-44. doi: 10.1080/02699050010007362. PMID: 11394973.

https://www.cdc.gov/headsup/helmets/index.html

https://www.everydayhealth.com/concussion/should-high-school-girl-lacrosse-players-be-required-to-wear-the-same-helmets-as-high-school-boys/

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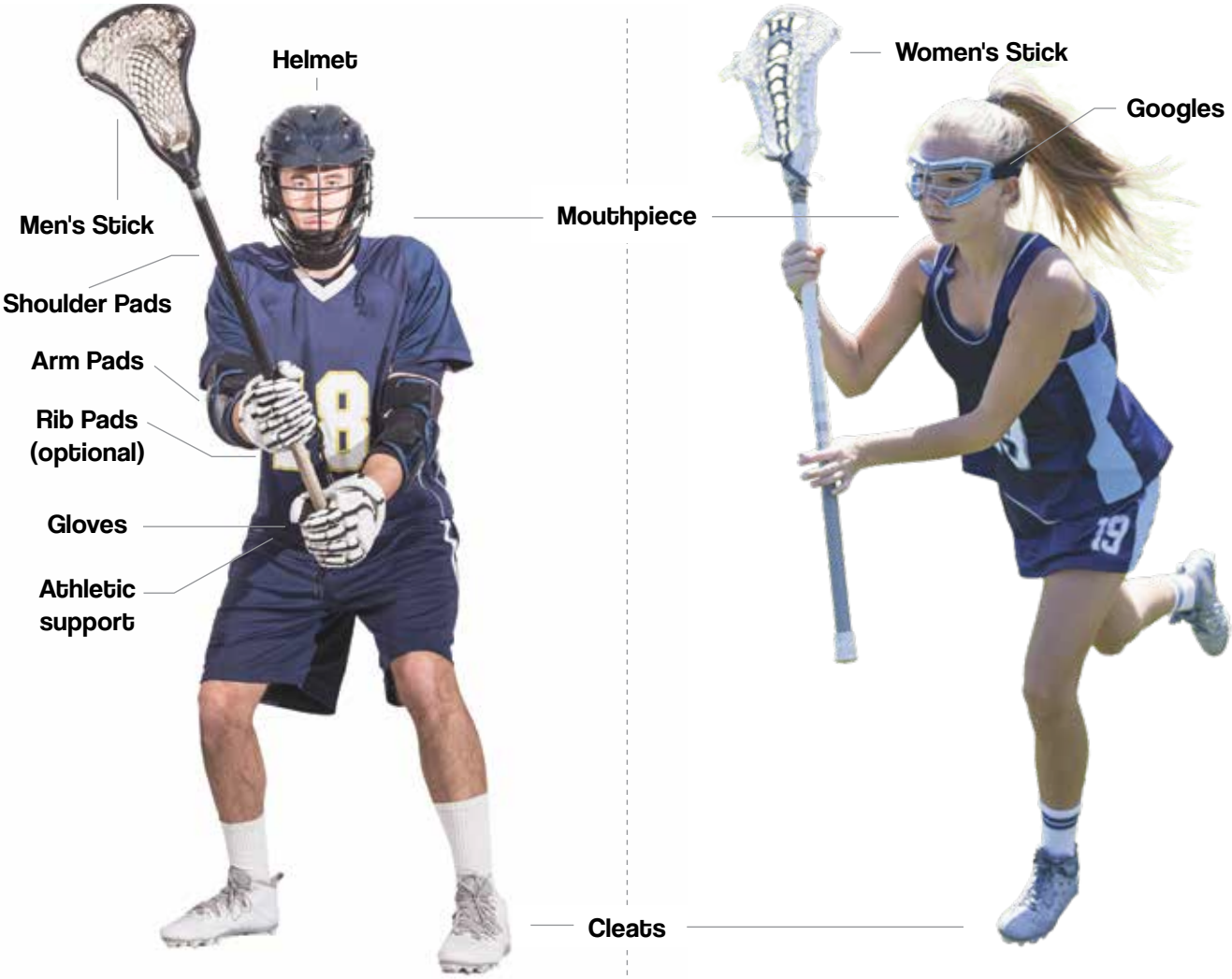
Men's vs. Women's Lacrosse Gear



Explain: Review the steps of the Engineering Design Process with students. Explain that helmets have already been engineered, so they will be working on Step 5 of the EDP to improve. Ask students to consider their ideas from *Engage* and what they read about in *Explore* to consider what improvements can be made to the safety equipment.

Explain that once the engineering design cycle is complete, it restarts. As you consider improvements, start again to ask about the problem and then imagine new ideas.

Define Criteria and Constraints, which can be found in the STEM Sports® Glossary in the front of the manual and at STEMSports.com under Resources. Work with students to list criteria and constraints for successful safety equipment. Reference examples in the table on the next page.

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Name: _____ Class: _____

Headgear

GRADES 6-8

Men's vs. Women's Lacrosse Gear

I notice...	I wonder...	I think...

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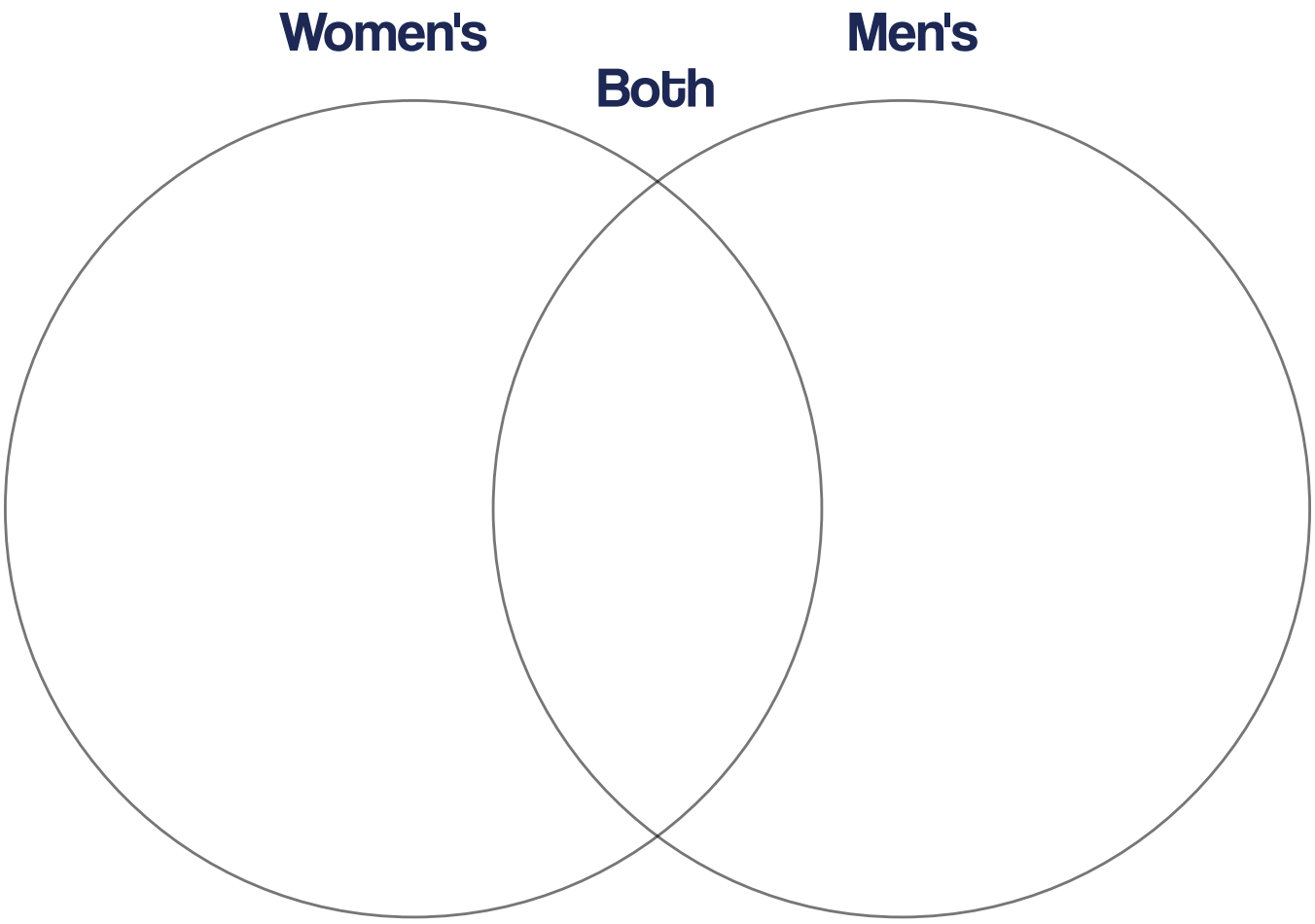
Name: _____ Class: _____

Headgear

GRADES 6-8

Men's required helmet	Women's required 'Head' protection	Women's optional 'soft sided' Helmet



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Module 8.0

Name: _____ Class: _____

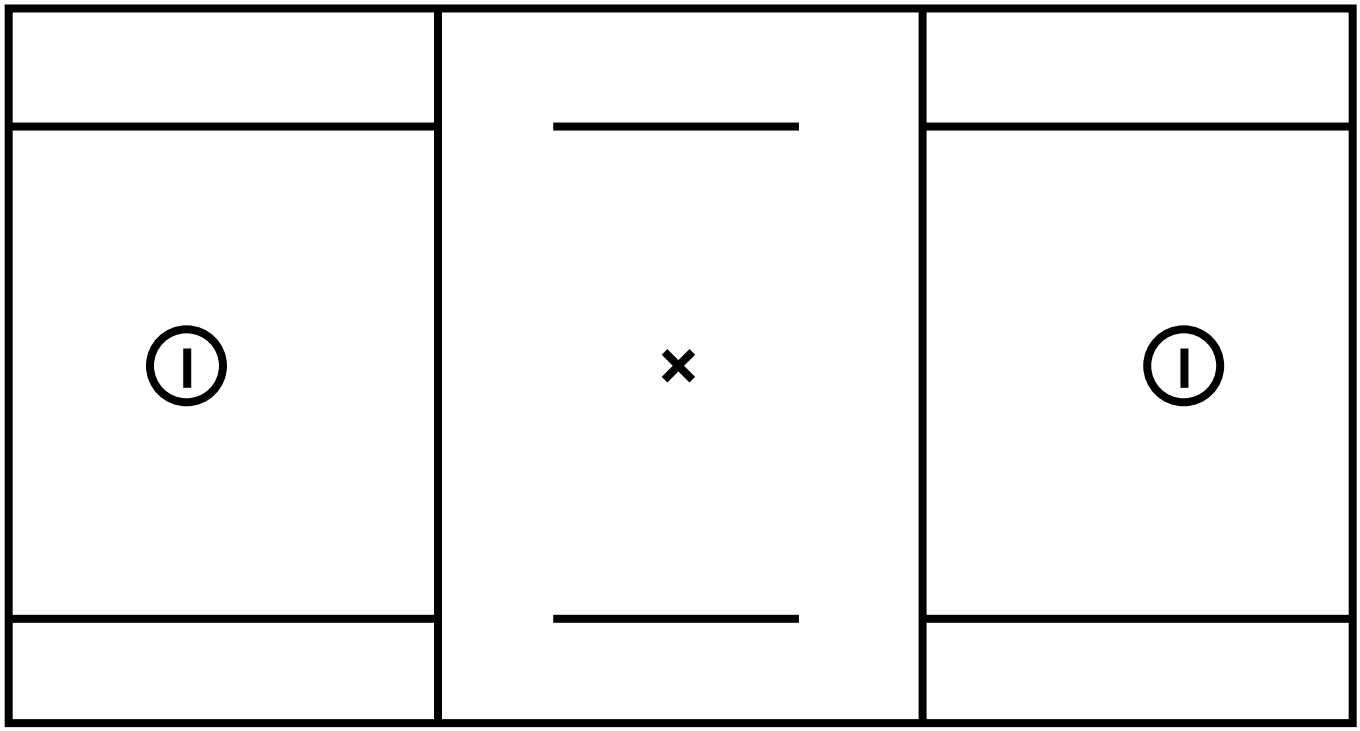
Wearable Technology

GRADES 6-8

Engage

Shade the field based on your area of play.

- Dark Grey: Area where you spent the most time.
- Light Grey: Area where you spent the least amount of time.
- White: Area where you spent no time.



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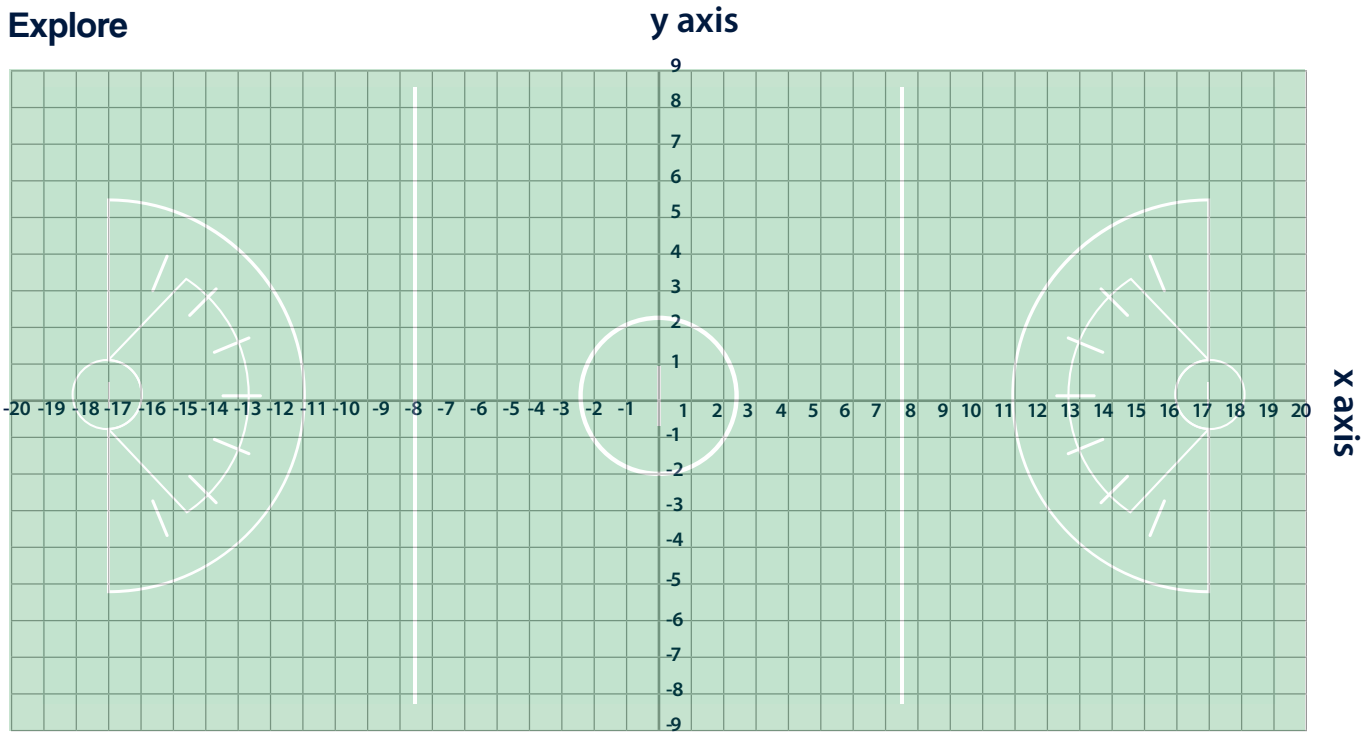
Name: _____ Class: _____

Wearable Technology

GRADES 6-8

Explore



PLAYER 1

X	Y
3	2
4	-1
5	1 (pass to player 2)
6	0

PLAYER 2

X	Y
3	4
4	4
5	2
6.5	3 (shoots)

PLAYER 3 (Starts with Ball)

X	Y
0	-5
3	-5 (pass to player 1)
4	-3
5	-2

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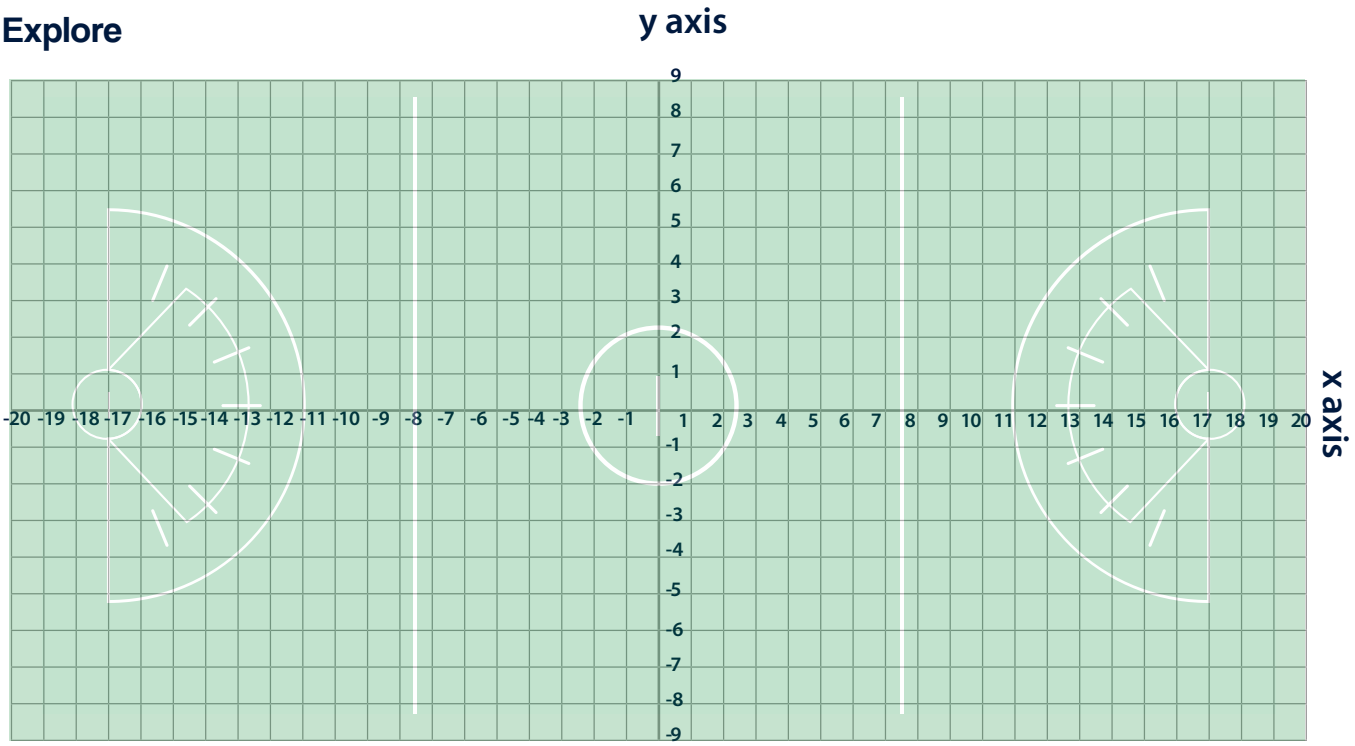
Name: _____ Class: _____

Wearable Technology

GRADES 6-8

Explore



PLAYER 1 (Starts with Ball)

X	Y
0	-5
3	-5 (pass to player 2)
4	-3
5	-2

PLAYER 2

X	Y
3	4
4	4
5	2
6.5	3 (pass to player 3)

PLAYER 3

X	Y
3	4
4	4
5	2
6.5	3 (shoots)

Prediction: _____

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"American Indian Stickball Collection" by Brian Larney
Artist: yahvlane
Seminole-Choctaw

Lacrosse: Yesterday vs. Today

Lacrosse has significant roots and is most popular in the Northeast and Midwest of the United States. To the indigenous tribes surrounding the Great Lakes, lacrosse or as it was originally called, "The Creator's Game," was a way of life. It was and is part of the spiritual, physical, and social aspects of the tribes. Many tribes participated in the game, including the Iroquois (Six Nations), many of the Algonquian people, and the five tribes of Oklahoma — Cherokee, Chickasaw, Choctaw, Creek, and Seminole.

Prior to white settlers, the game looked very different than today for Native Americans: purpose, ritual, and the physical components. The purpose of lacrosse was for the creator, which is where the name "Creator's Game" derived. It was played to please the creator in ceremonies during important times, such as the hunt and spring bloom. It was also used in intertribal relations to solve conflict or to celebrate. The game during this time was not played for personal gain.

Modern lacrosse has colonized the game

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Lacrosse was played to please the creator in ceremonies during important times, such as the hunt and spring bloom. It was also used in intertribal relations to solve conflict or to celebrate.

for purposes of team building, competition, fitness, and fun. Likewise, we see much personal gain by way of entertainment and competition to generate a high volume of fans at the collegiate and professional levels.

The purpose has changed drastically, as has the tangible, more physical aspects of the game. First, the field is different. It was not confined to 110 x 60 yards. The field was vast, sometimes up to two miles with no boundaries. Often the field included forested areas and other natural features. Goals may have been boulders and trees — a bit similar to modern lacrosse that uses a man-made net. Second, the equipment was different. Like many historic sports, safety equipment was not used. Therefore, no helmets, pads, or eye protection. The stick and ball also looked different. In fact, it was the cross-like 'net' that inspired the name Lacrosse from French settlers because it looked like a cross. The image above shows different sticks engineered by different tribes. Today's lacrosse stick was evolved from these early iterations. The ball was made of natural materials, such as animal hide and hair, wood, or rubber. Today, the ball is made of synthetic-like silicon or latex.

Finally, there were few rules in the original game. The play time varied, and could go from sunrise to sunset. Whereas today, the play

time is specific and intervaled. There was also not a specified number of players on a team, and positions, as we know and recognize in modern lacrosse, did not exist. Consequently, it was difficult to maintain positions on a two mile field of play. Lack of positions created a much different game, and there was not the same emphasis on coordinated teamwork as today.

When settlers began to play, they focused more on entertainment and recreation, as opposed to spiritual and social engagement. Today's game is much more technical, consisting of rules and equipment to ensure control. However, it is important to recognize the origin and creators of lacrosse: Native Americans. Is it time to incorporate some of the original purpose to honor the contribution and inventor of "The Creator's Game?"

Sources:
https://globalsportmatters.com/culture/2018/11/15/creators-game-moving-from-native-american-favorite-prime-time/

https://worldlacrosse.sport/about-world-lacrosse/origin-history/

https://nativeamericatoday.com/lacrosse-rooted-in-tribal-tradition/

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Name: _____ Class: _____

Capstone

GRADES 6-8

Peer Feedback Form

Presenter name: _____

STEM area: _____

Summary of the modern STEM area:

_____

_____

_____

What did the presenter explain as the Native American's ideas in the modern STEM area?

_____

_____

_____

What is one way the presenter said scientists, engineers, and other STEM professionals can honor and/or identify that their work is based on Native American contributions?

_____

_____

_____

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