FISTBALL LESSON PLANS *LESSON #6*

NPE Standard: 2. Applies knowledge of concepts, principles, strategies and tactics related to movement and performance.

Review: Lessons 1-5: (1) Rules, history; (2) Indirect (Bounce) closed-fist Pass; (3) Direct (No Bounce) closed-fist Pass; (4) Indirect (Bounce) Set; (5) Direct (No Bounce) Set

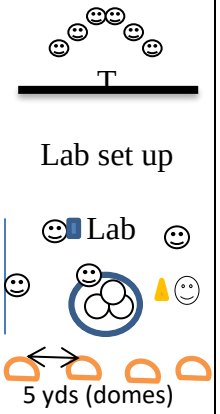
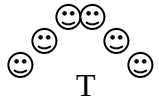
Teach: Fistball physics.

Equipment Needs:
- 18 Fistballs (3 for each station)
- 6 plastic hoops (corral the balls) (1 for each station)
- 18 cones (3 per station)
- 60 domes/cones (10 per station; 5 yards [1 yard=1 step] apart in single line dividing the 6 fields)
- 1 pencil per student
- 1 large empty field divided into 6 (**TIP**: This lesson is better if played ***OUTSIDE*** due to the lab the students will be participating in)
- 1 copy of "Fistball Physics," per student
- 1 copy "Fistball Physics Teacher Guide"
- 1 (plus extra) unused balloon

Equipment Needs (Optional):
- 1 clipboard per student (to write assessment data on)
- iPod/Music system/music (to be played in the background during the activity to motivate students)

Additional Information:
- Please refer to "Teaching Tips."
- **TECHNOLOGY INTEGRATION**: Have students:
    a. Perform "Assessment Sheet," at home using word processing software.
    b. Take an online test at home regarding the handout information.
- **LITERACY INTEGRATION**: Students can read aloud from handout. Words that are Bold, capitalized, underlined, highlighted in yellow, and italicized are ***VOCABULARY*** words (LITERACY/CORE).
- **MATH INTEGRATION**: Math is integrated by: (a) performing physic calculations to answer questions at the bottom of the handout "Fistball Physics."
- **SCIENCE INTEGRATION**: Science is integrated by using physics concepts (esp. Newton's laws) through a lab performed during class time.

Time	**Class Organization**	*LESSON #6 (Page 1 of 2)* **Learning Activities**	**Modification/ Extensions**	**Cues**
5-7 min	 T	***Lesson # 1-5 Review:*** ○ Students sit in semi-circle formation around the teacher. ○ Review Lesson #1-5 information/skills: ask students to answer questions: • **When is the PASS used**? (1) Receive serves/low balls; (2) Redirect ball off forearm w/closed fist in underhand motion to target (i.e. another person/over net). (In PASS handout). • **WHEN is the SET used**? (1) As an OFFENSIVE skill, where the ball is hit high in the air with the ball: (a) Bouncing (Indirect) or (b) Not Bouncing (Direct), before the attacker hits the ball over the net. • **HOW is the SET calculated?** By the ***TRAJECTORY***, so the bounce is at its highest point for an attacker to jump & touch the ball over the net. (In SET handout). • **Indirect/direct pass/set cues**: Get under ball; Face target; Bend knees; hands in fists, thumbs outside; Contact ball between wrists and elbows on fleshy part; Use shoulders and knees to provide force (see cues). • **What is "Calling for the ball"? Why/when is it used**? Calls off other players before contacting the ball, decreasing miscommunication during play. For example, call "I have it!" • **Difference between Indirect/Direct Pass/Set**? Indirect: Bounce ○ Give back/review graded Lesson #5 assessment. Students can take assessment home or place in portfolio. ○ Ask students if they have questions.	○ Students answer questions verbally &/or demo each skill cue ○ Place lesson 5 assessment in portfolio or to the side	○ Same arm/ leg tech ○ Contact (1 arm, forearm, fist closed) ○ Knees (bent) ○ Legs (extend when arm contacts ball) ○ Arms (stay still/don't swing) ○ Call the ball

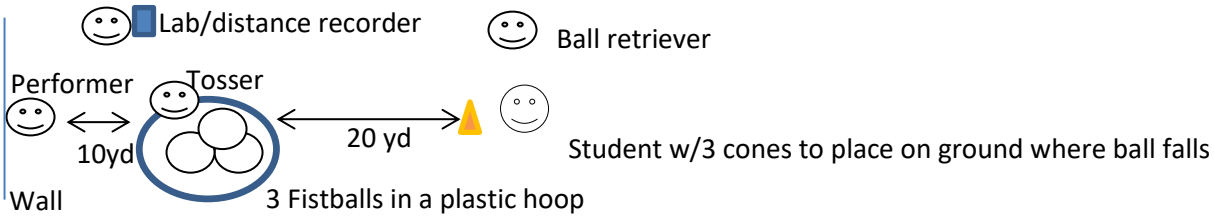
Time	**Class Organization**	*LESSON #6 (Page 2 of 2)* **Learning Activities**	**Modification/ Extensions**	**Cues**
50 min		***Fistball Physics:*** ○ Keep students sitting in semi-circle formation around the teacher. ○ Distribute handout (Fistball Physics) & a pencil to each student. ○ Teachers use the "Fistball Physics Teacher Guide" to teach Newton's law of motion & the lab experiment, to students. ○ Ask students if they have any questions. ○ Divide students into 6 groups of 5 students. ○ Escort students outside so they can perform the lab. ○ Students participate in lab for the remainder of the period. ○ Give students a 1-2 min warning to complete the lab/answer questions before moving on to "Closure." ○ (The lab can be performed w/2 students minimum, increasing participation [perform more trials]. Teacher needs to change handout to accommodate).	○ **Easier/Harder**: Decrease/Increase the passing score for the lab assessment ○ **Harder**: Perform more repetitions of each skill activity ○ **Extension**: Increase participation by creating smaller group sizes.	○ Tell students to focus on the lab so everyone can participate in this 1-DAY activity.
3-5 min		***Closure:*** ○ Students sit in semi-circle formation around the teacher. ○ Review: • The physics concepts &/or Questions at the bottom of the physics handout (**TIP**: Review info now or next class after teacher reviews scores & can give feedback on student performance). ○ Collect the labs (make sure names are at the top) ○ Review Lessons 1-5 if time allows. ○ Ask students if they have any questions.	○ Perform assessment as a homework assignment if there is no time to complete it in class.	○ Same arm/leg ○ Contact (forearm, fist closed) ○ Knees (bent) ○ Legs (extend) ○ Arms (don't swing) ○ Call for the ball

Lesson Reflection/Notes:

Fistball Physics Teacher Guide

This is a scripted guide to help teachers perform the lab successfully. Follow along the scripted lesson where:
RED text represents teacher questions/information to the students during the class.
BLUE text represents possible student answers to the teacher questions.
GREEN text represents lesson extensions (e.g. of planning for more than a 10 lesson unit, homework assignment, schools on a block schedule, etc.)

FIELD SET UP:



TEACHING FISTBALL PHYSICS PRE-LAB EXPERIMENT SET UP:

1. Set a Fistball on a stationary surface.
2. 1 unused balloon.

TEACHING FISTBALL PHYSICS INSTRUCTIONS:

1. Students sit in semi-circle formation around the teacher.
2. Distribute handout (Fistball Physics) & a pencil to each student.
3. Students read the first paragraph in the handout.
4. (**INTEGRATING LITERACY/TECHNOLOGY/SCIENCE IF TIME**: Work with the class to develop a definition of the word motion. Write a definition on the board that the class agrees upon and then compare it to the dictionary definition. Ensure that the students fully understand what motion means, because that understanding is pivotal to their comprehension of the laws of motion **OR** create a handout the students must complete for homework and come in for this lesson prepared to discuss Isaac Newton and the laws of motion).
5. *DEMONSTRATION OF THE FIRST LAW*: (Use Fistball to demonstrate the first law).
    a. Go to the still ball on a stationary surface.
    b. Ask students: **Why is the ball not moving**?
    c. Answer: **Because of the flat surface**.
    d. Push the ball forward to make it move.
    e. Ask students: **Why did the ball start moving**?
    f. Answer: **Because it was pushed**.
    g. Tell students: **Newton's first law of motion is the law of INERTIA which states objects at rest stay at rest and objects in motion stay in motion unless an outside source affects it**.
    h. Tell students: **Write the word "INERTIA" in the space provided next to the "1st Law."**
    i. Have a student (or read as a class in unison) the first law from the handout.
    j. (**IF TIME**: Have students define the law in their own words).

6. *DEMONSTRATION OF THE SECOND LAW*: (Use a Fistball to demonstrate the second law).
    a. Hold the Fistball and let it drop to the ground.
    b. Ask students: **How fast did the ball fall**?
    c. Allow students to answer and decide if the answers are correct.
    d. This time, pick up the ball & throw it hard to the ground.
    e. Ask students: **How fast did the ball fall this time?**
    f. Answer: **Speed higher than the first throw**.
    g. Ask students: **Why did the ball move more quickly the second throw**?
    h. Answer: **Because it was thrown**.
    i. Tell students: **Force was applied when the ball was thrown**. **Isaac Newton's second law involves applying force to an object, which affects its speed. This is the law of ACCELERATION.**
    j. Tell students: **Write the word "ACCELERATION" in the space provided next to the "2nd Law."**
    k. Have a student (or read as a class in unison) the first law from the handout.
    l. (**IF TIME**: Have students define the law in their own words).
7. *DEMONSTRATION OF THE THIRD LAW*: (Use a balloon to demonstrate the third law).
    a. Blow up the balloon and pinch it closed so the air doesn't escape.
    b. Tell students: **Watch what happens when I let go of the balloon**.
    c. Let the balloon go (Be ready for giggles).
    d. Ask students: **What happened to the balloon when I let it go?**
    e. Answer: **It moved**.
    f. Ask students: **What made the balloon move forward?**
    g. Answer: **Air being let out**.
    h. Tell students: **Newton's third law states for every action, there is an equal and opposite reaction. When the balloon is blown up it is being filled up with air that is under pressure. When the air escapes from the balloon the escaping air exerts thrust or force on the balloon which moves/propels it forward. The air escapes backward – the balloon races forward. ACTION/REACTION. Or more formally known as Newton's Third Law of Motion.**
    i. Tell students: **Write the word "ACTION/REACTION" in the space provided next to the "3rd Law."**
    j. Have a student (or read as a class in unison) the first law from the handout.
    k. (**IF TIME**: Have students define the law in their own words).
    l. (**IF TIME/OLDER (ADVANCED) STUDENTS**: use other action/reaction examples such as ACTION: Using a hockey stick to hit puck forward; what is the REACTION? [stick moves backward]. This is why it is important to FOLLOW THROUGH!! So, the puck goes further, or for any equipment so force isn't just absorbed and lost).

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LAB EXPERIMENT DIRECTIONS:

- Explain/have students read the directions regarding the experiment steps.
- Demonstrate the lab activities so students understand what to do when on the field (use the handout information).
- Explain the handout will be collected at the end of class. Therefore, complete the headings at the top of the handout. Their work will be graded. Each question is worth 10 points each, & a passing grade is 70% or higher.
- Students complete the experiment together, but answer the questions separately (complete their own work). No cheating (That is, unless you want students to work as a group).
- Ask students if they have any questions.
- Escort students to the field.
- Divide the class into 6 groups of 5 students in each group.
- After discussing info, students have the rest of the period to perform the experiment & complete all handout sections including the questions at the bottom of the handout.
- If students have questions while conducting experiments, tell them to raise their hand, and you will come to them.
- Remind students to be safe when retrieving equipment (as balls from other fields may come into their space).
- Give students a 1-2 min warning to complete the answers before moving on to "Closure."

Fistball Physics (3 pages)

Name: _____ Date: _____ Class: _____

Directions: Read & perform each lab experiment. After all the experiments are completed, answer the questions listed below. Each question is worth 10 points. A 70% or higher is a passing score. Good luck & have fun!

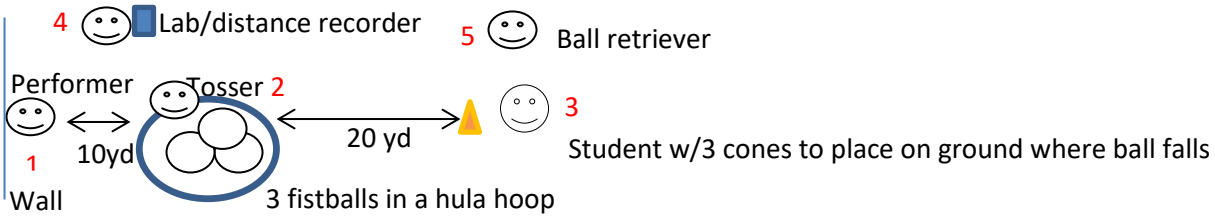
Today we are learning about Sir Isaac Newton. Sir Isaac Newton (December 1642 – March 1726), was a prominent mathematician, physicist, astronomer, theologian, and author. His most significant scientific works are his laws of motion. These laws explain why things move the way they do. There are three laws of motion.

1st Law: _____. An object at rest stays at rest and an object in motion stays in motion until acted upon by a force.

2nd Law: _____. Refers to the speed at which an object moves. This speed depends on the amount of force applied to the object. The more force used, the faster the object will move. Newton's second law gives a formula telling us how much force is needed and states that the force needed to accelerate an object equals the mass of the object multiplied by its acceleration, or: ***Force = Mass x Acceleration***.

3rd Law: _____. For every action there is an equal and opposite reaction. The terms action and reaction refer to forces. The key to getting this law right is understanding action-reaction pairs. Pair means two, so only two objects are in an action-reaction pair. For example, when throwing the ACTION is to throw the ball in an upward and forward direction. To do this the REACTION of the legs is to push down and backwards with the legs.

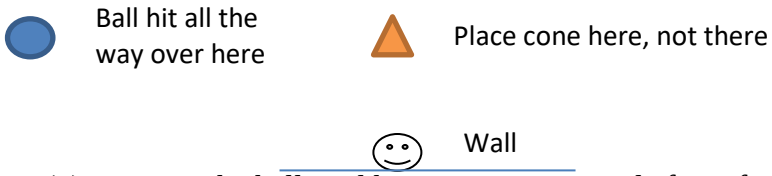
The Experiment:



Step 1:

1. Performer (1) stands with back against the wall. 3 balls in hula hoop @ 10 yds (steps) away.
2. The tosser (2) stands @ 10 yards away, with the 3 fistballs. The tosser underhand tosses a ball to the performer.
3. The performer keeps the BACK AGAINST WALL & passes the fistball, by SWINGING THE ARM, into the field (NO stepping forward, NO follow through, NO down/up).

4. The student in the field (3) places a cone where the ball landed, bringing the landing site back to the middle of play regardless of where the ball actually landed. For example, if the ball was hit way to the right, place the cone in the center of the field (This standardizes ALL trials since every student is doing it this way):



5. The ball retriever (4) retrieves the ball, and keeps it off to the side for safety.
6. Repeat until all the balls have been closed-fist passed into the field.
7. The lab/distance recorder (5) records distances **AFTER** all 3 balls are closed fist passed by counting the number of steps between the wall to each cone & records the steps in each corresponding box in the table below. **1 step = @ 1 yard.**
8. After the performer finishes, rotation is as follows:
    a. Performer (1) becomes the tosser (2).
    b. The tosser (2) becomes the student in the field (3).
    c. Student in the field (3) = Lab recorder (4)
    d. Lab recorder (4) = Ball retriever (5)
    e. Ball retriever (5) = Performer (1)

Step 2:

1. Stand 3 steps away from the wall (so you're closer to the tosser).
2. Perform same steps as STEP 1, with the exception of the following:
    a. Contact the ball with the arm naturally by stepping forward while making contact with the ball (do not add extra force). Stop the contact right after you made contact with the ball (NO follow through, NO knee up/down).

Step 3:

1. Repeat Step 2, but this time, perform the full closed-fist pass movement including:
    a. Take 1 step before strike the ball. Using same arm/same leg.
    b. Make contact with forearm, fist closed.
    c. Knees (bent).
    d. Legs (extend) using knees moving from down to up to create momentum.
    e. Arms (don't swing).
    f. After contacting the ball, continue moving forward (as you ready for the next play).

(CONTINUED)

	Distance: 1st attempt	**Distance: 2nd attempt**	**Distance: 3rd attempt**	**TOTAL**
Closed-fist pass w/back against wall				
Closed-fist pass 3 steps away; swing arm; legs parallel				
Closed-fist pass 3 steps away; w/same arm/leg; contact w/forearm /clenched fist; move from down/up position; don't swing arm; move forward				
Total Average				

Remember: 1 step = @ 1 yard

QUESTIONS: Each answer is worth 10 points each. You need a 70% to pass. Use the back of this handout to answer questions (remember to number your answers).

1. What did you change about your motion to make a ball go further?
2. What law applies **FORCE** to a ball?
3. What 2 parts of the body exert force when bumping a ball?
    a.
    b.
4. What direction is the force exerted on the arm when contacting the ball **FORWARD**?
5. What direction is the force exerted on the **LEGS** when the **BALL IS HIT UP**?
6. Which of Newton's laws is this an example of (using questions 4 & 5)?
7. Calculate the force (Newtons) of a regulation **FIST**ball (13 oz = Mass) leaving the hand (accelerating) 5 miles per hour (show your work. Look at page 1 for the equation to calculate this).
8. Calculate the force (Newtons) of a regulation **VOLLEY**ball (10oz) leaving the hand (accelerating) 5 miles per hour (show your work).
9. Knowing Newton's 2nd law of acceleration, which ball (Fist or volleyball) will take more force to accelerate?

Taking on Newton In-Class Worksheet: ANSWERS

1. What did you change about your motion to make a ball go further?
   (1) Follow through, (2) knees down to up, (3) arm doesn't swing
   (ANY/ALL OF THESE)(10 POINTS)

2. What law applies force to a ball?
   First: inertia (10 POINTS)

3. What 2 parts of the body exert force when bumping a ball?
   Arms (10 POINTS) and legs (10 POINTS)

4. What direction is the force exerted on the arm when contacting the ball **FORWARD**?
   Back (10 POINTS)

5. What direction is the force exerted on the **LEGS** when the **BALL IS HIT UP**?
   Down (10 POINTS)

6. Which of Newton's laws is question number 4 and 5 an example of?
   Third: action/reaction (10 POINTS)

7. Calculate the force (Newtons) of a regulation FISTball (13 oz = Mass) leaving the hand (accelerating) 5 miles per hour (show your work. Look at page 1 for the equation to calculate this).
   13 X 5 = 65 Newtons (10 POINTS)

8. Calculate the force (Newtons) of a regulation VOLLEYball (10oz) leaving the hand (accelerating) 5 miles per hour (show your work).
   10 x 5 = 50 Newtons (10 POINTS)

9. Knowing Newton's 2nd law of acceleration, which ball (Fist or volleyball) will take more force to accelerate?
   Fistball (with 65 Newtons vs only 50 Newtons for the volleyball) (10 POINTS)