Sports Orchestra: Patterned Play and Playing Patterns

Computational Thinking Focus: Pattern Recognition

Additional Computational Thinking Concepts Supported: Decomposition, Algorithm

Neurodiverse Workplace Skills: Problem Solving, Communicating, Persevering, Collaborating, Creating

Elements of Telematics: Embodied learning through movement, Collective/ensemble activities

Arizona Computer Science Standards
*Computing Systems (CS), Networks and the Internet (NI), Data and Analysis (DA), Algorithms and Programming (AP), Impacts of Computing (IC)

- 6.AP.PD.3 Test programs using a range of inputs and identify expected outputs.
- 6.AP.A.1 Identify planning strategies such as flowcharts or pseudocode, to simulate algorithms that solve problems.
- 7.AP.A.1 Use planning strategies, such as flowcharts or pseudocode, to develop algorithms to address complex problems.
- 6.AP.V.1 Identify variables that represent different data types and perform operations on their values.

- 6.AP.PD.1/7.AP.PD.1 Seek and incorporate feedback from team members and users to refine a solution that meets user needs.

Arizona Academic Standards for 6-8 Physical Education

- S1.M1 Dance and Rhythms. 8. Exhibits command of rhythm and timing by creating a movement sequence to music as an individual or in a group.
- S1.M2 Games and Sports: Invasion Games. 6. Throws with a mature pattern for distance or power appropriate to the practice task.
- S1.M20 Games and Sports: Fielding/Striking Games. 6. Strikes a pitched ball with an implement with force in a variety of practice tasks.

- S1.M24 Individual Performance Activities. 6. Demonstrates correct technique for basic skills in at least 1 self-selected individual-performance activity.
- S2.M12 Individual Performance. 8. Describes and applies the mechanical principles for a variety of movement patterns.

Objectives

- Students will identify patterns in baseball, including the various possible sequences within overall gameplay and the sequences in batting techniques.
- Students will demonstrate basic batting techniques.
- Students will connect movement and the axis of its orientation (input) to the sound (output) using the sensors and music apps.
- Students will use a table, graph, or flowchart to record patterns and inputs/outputs.
- Students will create and perform a movement sequence to music/sound (sports orchestra).

Timeline

Day 1: Activation and Foundations (60 minutes)

Day 2: Application (40- 60 minutes)

Day 3: Culmination (40-60 minutes)

Vocabulary

- Pattern
- Baseball game
- Sound effects
- Orchestra
- Hit
- Run
- Strike
- Foul Ball
- Home
- Homerun
- Technique
- Biomechanics

Materials

- 4 Wearable Music Sensors (e.g. M5Sticks) for whole group demonstrations
- Video clips of baseball/softball
- Video clip of basic batting technique
- Baseball sound clip playlist
- Teacher computer
- 1 computer per small group of 4
- 3-4 Wearable Music Sensors (e.g. M5Sticks) per small group of 4
- Velcro
- Projector and screen or TV
- Sonic Introduction app
- Sound Board app
- Nerf baseball bat (1 per group of 4)
- Nerf ball (1 per group of 4)
- Baseball glove (Optional: 1 per group of 4)
- Bases (Optional: 1 per group of 4)

Day 1:

Activation (Engage & Explore)

(30 minutes)

Find the Sound Board app on the website. Sound Board is the lowest icon in the left-hand sidebar on the instrument page. You can view our YouTube to watch a video explaining the instrument page if you need assistance. There are a selection of baseball sounds in the drop-down menus of this app. Familiarize yourself with them by clicking on the play buttons. Notice that there are five different sound players, each of which is triggered by its own button.

🧍‍🧍‍ Communicating:

Students are choosing from a variety of options to record and express their ideas.

❓ Problem Solving:

Students are determining which sounds are made by specific actions or motions. They are also identifying patterns in the game of baseball.

� Collaborating:

Students work together in small groups to organize sounds into a pattern that matches baseball rules. Students will need to navigate disagreements and find ways to come to consensus. They will need to explore various solutions and decide on one to share with the class.

Begin the lesson by asking your students to close their eyes and listen. Play some of the baseball game sounds using the Sound Board.

In this lesson, the Sound Board will be used to 'conduct' a sports game. Ask the students: Where are we? Where would we be if we were hearing these sounds? What happens there? Who has been to a baseball game or seen one on tv? Then play one of the sounds again and ask students, with their eyes closed, to demonstrate a movement (mime) that might produce that sound. Tell the students to open their eyes and make the movement with the sound. Play the sound again while the students mime the movement. Play a couple more sounds as the students mime related movements.

Now tell students that as you play the sounds, you want them to narrate what is happening. Students might wish to take the role of a sports commentator/announcer. Students can also write, pair share, or draw pictures of the events as the sounds are played. Play the sounds out of order (not the order they would occur in the game). Ask for a volunteer to share their baseball 'story' based on the sounds they heard. Remind the students that all the sounds were from a baseball game. Ask them if the sounds told the sound story of a baseball game. (No, they were all out of order.) Baseball games, or any game, has an order, rules, and patterns for how they are played. Ask: What happens first in the sequence of a baseball game?

Put the students in groups of 4. Give each group a laptop, 3-4 Wearable Music Sensors, and the Sound Board app. Show the students how to find the baseball sounds in the sound dropdown menu at the left or right of each of the five sound bars. Give the group the task of determining the order of the sounds that would occur in a real game. For example, hit (baseball bat), run (running on dirt), catch, cheer (sports cheering). Then have groups share out their sequences of sound.

Foundations (Explain)

Introducing vocabulary (30 minutes)

Explain that they have just figured out some of the patterns in a **baseball game**. One pattern might be: The next batter is called up, the pitcher pitches the ball, the batter hits the ball (hopefully), the batter runs to first base, the player

👫Communicating:

In the Foundations part of the lesson, vocabulary is being developed across content areas. Although there are domain specific terms, many real-life activities, including jobs, cross domains. Keep vocabulary words, and related visuals, displayed in the classroom.

catches the ball, and the crowd cheers. The **pattern** is a sequence of events that repeats. Make a class list of baseball words (**hit, run, strike, foul ball, home, homerun**, etc.) that might make up part of a baseball game pattern.

Then explain that an **orchestra** is a group of musicians that play instruments together. Ask: What might an orchestra have to do with baseball? Explain that in this lesson, the students will be musicians using the various NEWMT instruments to play the sounds (music) of the baseball game.

Give or show examples of how movies, video games, and radio use music scores and **sound effects** by adding sounds to stories and character actions. Foley artists make sounds for media by watching it and creating sounds at the right time to match the media. Example videos can be found here: https://www.youtube.com/watch?v=UO3N_PRIgX0 and https://www.youtube.com/watch?v=OONaPcZ4EAs Explain that the students will be the baseball player characters and the musicians that make the sounds to match the baseball player's motions. To do that they will need to determine which movements match which sounds.

Show the following chart to the whole class. Choose one sound from the Sound Board app baseball sounds. Write the name of the sound in the second column and what it sounds like in the third column. Ask the students to demonstrate the types of baseball movements that would create the sound and write it in the first column.

Movement (input)	Sound (output)	
Describe the motion:	Title of Sound Clip	Sounds like:

Finally, explain that people who play sports, or athletes, work on their **technique**. Techniques are the basic movements in a sport. Patterns of movements are put together to create pitching techniques, batting techniques, running techniques, and so on. Players work on their techniques to improve and have a better chance of winning the game.

Tell the students that next time, they will study a couple of baseball techniques and use the sensors and apps to create and perform a sports orchestra.

Day 2:

Application (Elaboration)

(40-60 minutes)

This lesson will work best in a large open space that does not have a lot of echo, but still has WiFi access. Make sure that laptops and sensors are fully charged before the lesson. You will be using the Sonic Introduction instrument group. On the instrument page there is a button that says "Sonic Introduction", click this to load the instrument group. Sonic Introduction is made up of two instruments, Tap and Loop. To introduce the students to the Sonic Introduction app, show how the Tap section of sonic introduction is best used for the one-shot sounds like the bat or catch sounds, and the Loop section is best used for looping sounds like the sounds of running or crowd cheering. Explain that one person in their group will use a sensor to make the baseball catching sound each time someone actually catches the ball (they can either trigger this sound using another sensor and Tap, they can click the play button next to the sound dropdown in Tap, or they can use the Soundboard app to trigger the catching sound with the click of their mouse). The movement of the bat with the sensor attached will trigger the baseball batting sound.

Prepare a laptop and a Nerf bat and ball for each small group of four. The bat should have a sensor attached lengthwise using Velcro. Make sure your sensors are in "EASY" mode by clicking the big button on the front. EASY mode is the most intuitive mode and will probably be the best for this lesson. Alternatively, there are two other modes to experiment with. Gyroscope mode (GYRO) is for sharp movements like the swinging of the bat.

🧗 Persevering:

Students will try to copy the demonstrated techniques. It could take several tries to learn the sequence of movements demonstrated.

Also, the basic technique that is demonstrated might not work best for everyone. Students might need to adapt the basic technique to a pattern that works best for them.

Encourage the students to replay the instructional videos on their laptop as much as needed.

There might be students in the classroom who are baseball or softball players. They can be spread out among the groups. They might be interested in sharing their expertise with their peers but should not be required to do so.

The basic pitching technique includes many more steps than the batting technique. If needed, pitching can be moved to a separate lesson on another day or removed completely.

Accelerometer mode (ACCEL) is for smooth gradual motions like bringing your mit up to catch a ball. Assuming your sensor is in EASY mode, the bat/sensor should be linked to the "baseball bat" sound using the Pitch axis on Tap. One other sensor should be attached to the Pitch axis on another instance of Tap and linked to "baseball catch" sound. Make sure the sensors are attached correctly so that the sounds will be generated with the appropriate motion.

Remind the students that they have been studying patterns of movement and sound. Today they will do two things: Work on batting techniques and begin to create a sports orchestra by matching movements to sound effects.

Place students into groups of four. Give each group a laptop and a Nerf bat and ball.

Demonstrate a basic batting technique (how to stand, hold the bat, and swing). Use a video, if needed. https://www.youtube.com/watch?v=G_n_tlesB-I This video uses the technique pattern:

1) grip

2) load

3) stride

4) swing

Have each student in the group try the movement pattern with the bat a couple of times without sound. Then turn on the laptop sound and have the students try again. The baseball bat sound should occur when the student is swinging the bat.

Next, have one person in each group connect a second sensor to a new instance of Tap, experiment with Pitch or Roll to mimic different actions (Shake can also be good for things like running sounds. This person is in charge of mimicking the the baseball catch movement to trigger the baseball catch sound each time someone catches the actual ball. Have one person in the group take the role of the catcher. This person should stand behind the batter.

Explain that you will pitch the ball so they can practice batting. Remind them that they are working on technique (not power or distance) and do not have to hit the ball far for this activity. (You can give them time after the lesson to remove the Sensors from the bat and hit the ball hard and far for a few minutes, if you are outdoors.) Give groups time to work on this. Have students in each group rotate as batter, catcher, computer/app monitor, and pitcher.

Explain that by putting the movements and sounds together in a pattern of pitch, swing, and catch they have begun to practice the sound effects for a baseball game orchestra.

Day 3:

Culmination (Evaluate)

(40-60 minutes)

Direct the students to work in groups of four again. Tell them that they will be creating the sports orchestra today using the movements and sounds they created last time as well as some new ones. Explain that they can choose two or more sounds from the baseball game sound effects on the Soundboard or the Sonic Introduction instrument group (Tap and Loop). They will need to choose sound clips, axis, and Tap or Loop when deciding on their movements and sounds. Explain that accelerometer mode is best for sounds you want to trigger with a smooth motion (like the sound of the running footsteps coming in and out using the Loop section of Sonic Introduction).

Hand out hard copies or give access to digital copies of a chart like the one below. Students can use this chart to help plan each movement in the baseball pattern and the related sounds for their orchestra. Give the students about 20 minutes to plan and practice their performances, which should be no longer than 15-30 seconds. Allow students to collaborate while you walk around, observe, and listen. Provide support when needed.

Movement (input)		Sound (output)		
Which axis?	Describe the technique steps.	Title of sound clip	Tap or Loop	Sounds like:

✹ Collaborating:

Students may need support in distributing jobs, tasks, organizing, and planning their performance. Again, students will need to navigate disagreements and find ways to come to consensus. They will need to explore various solutions and decide on one to share with the class.

✗ Creating:

There are many combinations of baseball patterns and types of sounds that can be used in this activity. Each group might end up with a different orchestra (musical score and played sound effects). Encourage groups to try different patterns before deciding on a final one to share with the class.

Example: z	Swing the bat	Baseball bat	tap	Bat hitting ball

After about 20 minutes, have groups perform for their peers.

After every group has performed their sports orchestra, tell the class that they will spend time reflecting on the activity. Have the students return to their groups to discuss the following:

1. How did your group design the sports orchestra? How did you make decisions about movements, sounds, and sports patterns?
2. What was the most challenging part of designing a sports orchestra?
3. What is one thing you might change in your baseball pattern for the next time you perform, and why?

Groups can choose a person to be recorder to write or draw their discussion on paper or an online document or to audio record the discussion. After about 10 minutes, ask a representative from each group to share out to the whole group. Highlight discussion points related to pattern recognition, orchestra, sound, instruments, and technique.

Adaptations:

1. If the batting, catching, pitching in baseball/softball will not be physically inclusive for your students, choose a different group sport that will work for all your students, right now the only other sport sounds are basketball sounds. Alternatively, you could do this same lesson but instead of scoring a baseball game, score a story. In this adaption, either find a movie clip, use a nursery rhyme, or make up a story that your students can add sounds and music too (e.g. A story that involves a cow jumping over the moon may use jumping and whooshing sounds to illustrate in sound what the cow is doing). In this exercise, the pattern emphasis is on the

narrative structure of the story (The whooshing sound won't play until the cow is jumping over the moon).

2. Remind students that not all people move in the same way. One technique might work for some people, but not others. Some students might have to find or even create their own techniques for specific movements.
3. Movement triggers sound in this activity. For students with hearing impairments, have the fourth student in the group display a visual that connects to the sound whenever it plays. Do the same when students perform for the whole class.
4. For students with visual impairments, teach technique using very descriptive words, including body oriented and directional language.
5. For students working beyond the basics of batting and catching, allow opportunity to use a more advanced technique or to teach a more advanced technique to someone who would like to learn more. Even though the basic techniques are demonstrated for the class, every student does not have to choose the basic technique during their performances.

Extensions:

1. Create and perform a variety of sequences that might occur in baseball. Discuss how there are several ways that the game might play out. For example:
    a. Pitch, swing, strike, pitch, bat, hit, run to first
    b. Pitch, swing, hit, run, out
    c. Pitch, swing, hit, run to first, run to second, run to third, homerun, cheer
2. Create and perform sports orchestras for other sports or stories. Keep a record of the patterns and sequences used.
3. Create and perform a dance (unrelated to a sport) using movement patterns and the wearable devices. Keep a record of the patterns and sequences used.
4. Tell the students that there is a science that studies how humans move their bodies. It is called biomechanics. Biomechanics is used to study athletes and their technique. Show this short video: https://youtu.be/vglcn72rfEM?si=U2lBIfvljfHOu8-_ Find more information here: https://www.physio-pedia.com/Biomechanics_In_Sport Some students might be interested in studying more about biomechanics and careers in biomechanics.

Expansions:

1. Language Pattern Recognition

Discuss how pattern recognition is used in artificial intelligence (AI) for things like text translation and grammar correction. Give the students a list of simple sentences in the language they are studying and ask them to figure out which sentences are following the pattern of the language. For example, some sentence patterns in English are:

2. Subject, verb
3. Subject, verb, object
4. Subject, verb, adjective
5. Subject, verb, adverb

Alternately, put students in groups of three. Hand out word cards. Color code by type of word (subject words, verbs, objects, adjectives, adverbs), and add an image if it will be helpful to your students. Ask groups to create a given grammar pattern and see how many interesting (or silly) sentences they can create that are also grammatically correct.

Students can then find movements and sounds to match their word cards. Using the sensor and apps, groups can read their sentences with sound effects.