STEM Lesson Plan, Step by Step Directions: Grade 4-6

1. Class Objective: Students will apply STEM research to learn about how to improve bowling technique and score.
	1. Pre-visit: the students will watch a couple of short videos and complete a simulated bowling experiment covering the concepts of friction and speed.
	2. Visit: Students will take a guided tour of the International Bowling Museum and Hall of Fame to learn about how STEM research is applied at the International Bowling Campus on a day to day basis as well as by avid bowlers around the world.
2. Connection to Course Goals: Using hands on activities to understand how one can improve bowling technique through STEM.

Pre-visit Activity (30 minutes)

1. Hook: “What’s the secret to a perfect strike?” Ask the students to write a STEM description of how to make a perfect strike in bowling. Have them cover how the player must move step by step to make this happen with as much scientific vocabulary as they can: weight of ball, acceleration of player, acceleration and hook of ball, friction of ball on the oiled lane, angle of ball hitting the pins.
2. What you’ll need: Copies of Worksheet and Glossary of Terms. Access to YouTube. Any type of solid spherical ball. A carpeted area. A smooth area. A stopwatch.
3. After students have written down their descriptions, access YouTube and show “The Secret to a Perfect Strike” video. https://www.youtube.com/watch?v=0EVw8c-X1l4 Review with your students afterwards what aspects make a perfect strike and how the momentum, force, hook, and friction of the ball affects a player’s strike rate.
4. Next, ask for two volunteer students.
	1. *Friction*: To prepare for the activity, designate two locations students can all gather around that can be marked off with measurements. One location should have a smooth surface, similar to a bowling alley’s surface. The other should be carpeted, or rough. The measurements should be the same specific distance in meters from point A to point B, but if markings can’t be made on these surfaces, give a student volunteer a measuring stick/tape. Give another student a stopwatch, and another student a solid ball. Have the student with the ball lightly toss/roll it down the measured path similar to throwing a bowling ball and have the other student time it and measure each roll’s distance. Do this three times on both types of surfaces (see Worksheet’s graph). The students will notice the ball rolls slower on the rough surface. Have the class write on the Worksheet’s first graph why they think the change of speed occurs using the Glossary of Terms.
	2. *Speed:* Do the same run through on the smooth surface going three different speeds and use the formula on the Worksheet to fill out the graph: Speed = Distance in meters/Time in seconds to determine the speed of the ball. Have them average the results and discuss. Average = (a + b + c)/3
5. Review all terms learned in the lesson and brief students about their tour at the International Bowling Museum and Hall of Fame!

STEM Self-Guided Tour and Recommended Itinerary (2 Hours)

1. 5 minutes. Students will be greeted by the Group Tour Director Kari Smith and accounted for in the Gift Shop.
2. 20 minutes. Students will go through the historical exhibits of the museum, covering the first traces of bowling found in Egyptian tombs to today’s current bowling culture: casual and professional.
3. 15 minutes. Students will watch a film in our theater summarizing bowling’s historical context.
4. 20 minutes. Students will explore the international bowling, youth bowling, and modern players bowling exhibits and may be split up to play two different games: Carmen Salvino: a trivia game about the international scope of bowling and Coach’s Corner: the technical aspects of bowling.
5. 20 minutes. Students will go through the Science of Bowling exhibits covering how the equipment is made and used (technology and engineering), the standard measurements for the lanes and equipment (math), and the effect various oil patterns have on the friction and momentum of a ball (science).
6. 25 minutes. Students may be divided into teams to take turns playing on our mini Highway 66 bowling lanes to create a hands-on learning experience of concepts such as force, speed, acceleration, and friction.
7. 15 minutes. Students may use the interactive touchscreens to look up their favorite Bowling Hall of Famers and shop in the gift shop.