STEM Activity: Data of Bowling

Type of Teacher Tool: Whole Class
Targeted Grade Level(s): 9-12
Targeted Curriculum Areas: Physics and Mathematics

Learning Objectives:
The learner will:
1. Students will practice finding the mean, median, standard deviation and calculate the force
2. Students will increase their understanding of data sets and use standard deviation to evaluate the variation between bowls
3. Students will use data to calculate momentum

Featured National Standards
1. CCSS.ELA-LITERACY.RST.9-10.3
   Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
2. CCSS.ELA-LITERACY.RST.9-10.7
   Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
3. CCSS.ELA-LITERACY.RST.11-12.9
   Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
4. Interpreting Categorical and Quantitative Data
   Summarize, represent, and interpret data on a single count or measurement variable
   Summarize, represent, and interpret data on two categorical and quantitative variables
   Interpret linear models

Resources/Materials Needed:
1. Physics 8: The Science behind Bowling
2. Physics 11: Newton’s First Law of Motion
3. Physics 13: Velocity and Acceleration
4. Physics 15: Finding the Average Velocity
5. Chart provided
6. Bowling Alley

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Teacher Instructions:
1. Plan a trip to a local bowling alley where the speed of the ball is shown on the score monitor.
2. For use prior to the trip to the alley, have students watch any combination of the Educate.Today videos listed above that you think would be most helpful in providing background information for them prior to their data experiment.
3. Have students record their speed for each bowl to use as their data set.
4. In class have students calculate the mean, median and mode of their data set.
5. Students should use the formula Momentum = Mass x Acceleration to calculate and record the momentum of each bowl, using the recorded speed and the weight of the bowling ball they used.
6. Have students compare results with other students and speculate as to what changes they might make to improve their game.

Assessment/Evaluation Option:
1. Use the chart provided on the next page for students to record their results and turn in to be graded on accuracy.
<table>
<thead>
<tr>
<th>Bowl</th>
<th>Speed</th>
<th>Momentum</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
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</tbody>
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<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Standard Deviation</th>
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</thead>
<tbody>
<tr>
<td>Velocity</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Momentum</td>
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