Dart Gun Velocity

By Ken Ragan

In Class (Instructor) | **In Class (Students)**

Begin Here.

The instructor shows the students a dart gun (which fires foam darts), firing a few darts in demonstration.

01

In small groups, pairs, or even individually, students are asked to find a relationship between the muzzle velocity and time taken by the projectile to return to its original position if fired directly upward: $v = \frac{gt}{2}$.

The instructor gives a mini-lecture on measurement uncertainties.

02

Students in the class are asked to pull out stopwatches/smartphones. The instructor counts down ("3, 2, 1, start... 3, 2, 1, stop"), with the students measuring the time between the "start" and "stop". The instructor then chooses several students at random, creating a list of their results.

The instructor leads the class through the identification of outliers and the calculation of a mean value.

The instructor counts down, then fires the dart gun directly upward. Students measure the time it takes for the projectile to return to its original height. The instructor again chooses several students and lists their results, identifying outliers and calculating the average.

03

In their groups/pairs or individually, students calculate the muzzle velocity of the dart gun.

Students are asked to calculate the maximum range of the dart gun, and to determine at what angle this max range will be acheived.

04

Students are selected to measure out this distance, either chalking out a line at the front of the class or having a student stand at the maximum range of the dart gun. The instructor then holds the dart gun at a 45° angle near the ground and fires it. Students can then compare their theoretical result to the actual result.

Work in Groups

Whole Class

Problem Solving

Discussion

Instruction

Bloom's Taxonomy

- ★☆☆☆☆☆ Remember
- ★★☆☆☆☆ Understand
- ★★★☆☆☆ Apply
- ★★★★☆☆ Analyze
- ★★★★★☆ Evaluate
- ★★★★★★ Create