



In Class (Instructor)



In Class (Students)

Begin Here.

Instructor assigns students to groups of 3-4.

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|------------------|-----------------|
| | Individual Work |
| | Work in Groups |
| | Whole Class |
| | Research |
| | Upload |
| | Problem Solving |
| | Discussion |
| Bloom's Taxonomy | |
| | Remember |
| | Understand |
| | Apply |
| | Analyze |
| | Evaluate |
| | Create |

Students go outdoors and film a video of themselves throwing an object, ensuring that a distance calibration tool (such as a meter stick) is visible in the video and that the camera is stationary throughout the video.

01

In the classroom, at computers, students upload their video into the Tracker Software.

In the tracker software, students use the calibration tool to calibrate their video and set up the axes.

02

Students use the software to track the position of their object in each frame as a point mass. The software will automatically create tabulated data for the position and velocity over time in both the x and y directions. Students export this tabulated data.

Working alone (or in pairs if computers are limited), students import the tabulated data into a spreadsheet program such as Excel.

Students create three new columns in the table for potential energy, kinetic energy, and total energy. Students use spreadsheet formulas to populate these columns.

03

Students plot all three (potential, kinetic, and total energy) on the same graph in their spreadsheet program.

Students return to their original groups, comparing their resulting plots and discussing the implications. If energy was not constant over time, they should discuss where energy could be lost.

04

The instructor leads a class discussion, reflecting on and discussing the resulting graphs in terms of conservation of energy.