

TEACHING MOTION CONCEPTS THROUGH TRACKER - BASED VIDEO ANALYSIS

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Difficulties in understanding concepts of kinematics are widespread among students at various educational levels as documented in physics educational research. Also, students find it challenging to connect the concepts of motion with equations and graphs that describe these concepts. Such difficulties often originate from intuitive understanding, shaped by their everyday experiences, which can conflict with scientific explanations. Without appropriate instructional intervention students' misunderstandings regarding motion concepts are likely to persist and become reinforced over time, making it increasingly difficult for students to grasp more advanced topics in physics.

This work presents a learning model that utilizes Tracker software to examine videos of the free fall and oscillatory motion experiments. By directly observing and tracking object motion, this approach helps students to develop a deeper understanding of the concepts of position, velocity, and acceleration. The method combines hands-on experiments with computer modeling, allowing students to analyze data and represent motion graphically and analytically. The accuracy of using Tracker software is evaluated through the measurement of the magnitude of gravitational acceleration. In the first method, where free fall experiment video was analyzed by Tracker, an average value of $g = 9.984 \pm 0.611 \text{ m/s}^2$ resulted. In the second method, analyzing the video of a simple pendulum experiment by using Tracker resulted in $g = 9.864 \pm 0.094 \text{ m/s}^2$. Both results are in agreement with generally accepted gravitational acceleration and support the validity of using Tracker video analysis as an effective tool for school laboratory purposes.

Keywords: Tracker, experiment, video analysis, position, velocity, acceleration, free fall, oscillations.

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