Hot Wheels

Mid-Valley
STEM-CTE HUB

www.midvalleystem.org
midvalleystemctehub@linnbenton.edu
Linn-Benton Community College
Albany Campus - CC-212

Mid-Valley
STEM-CTE HUB

Hot Wheels

The Hot Wheels STEM Kit engages students in physics, engineering, and problem-solving through hands-on experimentation with speed, motion, and force. By designing and modifying Hot Wheels tracks, students explore concepts such as acceleration, friction, gravity, and energy transfer. This kit encourages creativity and critical thinking as students build, test, and optimize their track designs, applying real-world physics in an exciting and interactive way.

Grade Level

2nd - 12th grades

Group Size

Small groups

Time Duration

30 minutes - 2 hours

Content of Kits

Components

- Track Builder box
- Curved track pieces
- Short track pieces
- Long Track Pieces
- 2x Loop tracks
- 4x Obstacles
- 3x Car launchers
- 5x Hot Wheels cars
- Track connectors

Mid-Valley
STEM-CTE HUB

Usage

Getting Started

1. **Introduce Motion Concepts** – Explain basic physics principles like gravity, friction, and momentum before building tracks.

2. **Start with a Simple Track** – Have students construct a basic straight track and observe how the cars move.

3. **Experiment with Launchers** – Show how different force levels affect speed and distance.

4. **Test & Adjust Track Configurations** – Encourage students to modify their track layout and observe changes in car movement.

5. **Encourage Collaboration** – Have students work in teams to build, test, and refine track designs.

Storage

- **Keep Track Pieces Organized** – Store different track types separately in labeled bins.
- **Use the Track Builder Box** – Keep all components in one place for easy setup and cleanup.
- **Prevent Lost Pieces** – Assign students responsibility for checking parts before and after use.

Troubleshooting

- **Cars Not Completing the Track** – Adjust launcher force, ensure track connections are secure, and check for misaligned pieces.
- **Loops Not Working** – Increase starting height or adjust launch strength to provide enough momentum.
- **Cars Slowing Down Too Much** – Reduce friction by ensuring the track is smooth and free from debris.
- **Track Pieces Not Connecting** – Verify that connectors are properly aligned and securely attached.

Mid-Valley
STEM-CTE HUB

Activity Guide

Beginner

Ramp & Speed Exploration
Students will build a simple downhill ramp using track pieces and a car launcher. They will test how the starting height of the ramp affects car speed, recording their results and discussing how gravity influences motion.

Intermediate

Loop-the-Loop Challenge
Students will use the loop tracks to explore how speed affects whether a car successfully completes a loop. They will adjust launch strength, measure velocity, and analyze why some attempts succeed while others fail.

Advanced

Obstacle Course Engineering
Students will design and build a complex track featuring obstacles, loops, and multiple track connections. They will troubleshoot issues such as car speed, trajectory, and force distribution to create a successful course.

Extension Activities:

Energy Transfer Experiment
Students will modify their tracks to incorporate collisions, jumps, or chain reactions. They will analyze how energy is transferred between objects and predict how different track designs affect the results

Race & Data Collection
Students will time cars on different track designs, collect data on speed and distance, and create graphs to compare results. They will discuss variables such as friction, slope, and force.

Mid-Valley
STEM-CTE HUB

Learning Extensions

STEAM Connections: Engineering - Science - Math

Learning Objectives:

- Explore physics concepts like motion, acceleration, friction, and gravity.
- Develop problem-solving skills through hands-on experimentation and engineering challenges.
- Apply scientific methods by testing, recording, and analyzing track performance data.
- Strengthen collaboration and teamwork while designing creative track layouts.
- Understand energy transfer through collisions, loops, and track modifications.

Career Connections:

- **Mechanical Engineering** – Introduces principles of motion, force, and design applicable to real-world engineering.
- **Physics & Scientific Research** – Reinforces concepts in motion, energy transfer, and experimental testing.
- **Automotive Design & Aerodynamics** – Connects to careers in designing efficient and high-performance vehicles.
- **Theme Park & Roller Coaster Engineering** – Introduces track design and forces relevant to amusement ride construction.
- **Data Science & Analytics** – Encourages collection and analysis of speed, force, and motion-related data.

Essential Employability Skills:

- Critical thinking
- Creative problem-solving
- Computational thinking
- Digital literacy
- Communication
- Innovation

Mid-Valley
STEM-CTE HUB

Resources and Accessibility

Safety Guidelines

- **Use Launchers Responsibly** – Ensure students do not aim launchers at themselves or others.
- **Secure Track Setups** – Prevent track sections from becoming unstable or collapsing.
- **Keep Workspaces Clear** – Maintain an organized area to prevent tripping hazards.

Accessibility

- **Adaptive Track Placement** – Set up tracks at table height or on large, flat surfaces for students with mobility challenges.
- **Visual & Auditory Cue**s – Encourage students with visual impairments to listen for the speed and impact of cars or use tactile feedback.
- **Collaborative Building** – Pair students with different abilities to design and test tracks together.
- **Alternative Engagement Methods** – Allow students to participate by timing races, recording observations, or analyzing data if they cannot physically construct tracks.

Library Catalog

Library Resources

Feedback

QR to feedback survey