Marietta City Schools

2024–2025 District Unit Planner

Grade & Course: Physics	**Topic:** 2D Motion	**Duration:** 6 weeks
Teachers: Physics PLC Teachers		

Georgia Standards and Content:

SP1c-d

c. Ask questions to compare and contrast scalar and vector quantities.

d. Analyze and interpret data of two-dimensional motion with constant acceleration.

- Resolve position, velocity, or acceleration vectors into components (x and y, horizontal and vertical).
- Add vectors graphically and mathematically by adding components.
- Interpret problems to show that objects moving in two dimensions have independent motions along each coordinate axis.
- Design an experiment to investigate the projectile motion of an object by collecting and analyzing data using kinematic equations.
- Predict and describe how changes to initial conditions affect the resulting motion.
- Calculate range and time in the air for a horizontally launched projectile.

SP2d

d. Plan and carry out an investigation to gather evidence to identify the force or force component responsible for causing an object to move along a circular path.

- Calculate the magnitude of a centripetal acceleration.

Narrative / Background Information

Prior Student Knowledge: (REFLECTION – PRIOR TO TEACHING THE UNIT)

From 8th grade Physical Science

- Basic algebra
- Basic understanding of distance, speed, and acceleration

From Previous unit (1D Motion)

- Solving constant velocity problems
- Solving position kinematic problems
- Definition of vector and examples
- Conceptual understanding of constant velocity vs acceleration

Year-Long Anchoring Phenomena: (LEARNING PROCESS)

The laws of physics dictate the interactions of our physical world.

Unit Phenomena (LEARNING PROCESS)
The hammer throw in track & field requires precise motion in order to launch the hammer for max range

MYP Inquiry Statement:
Modeling changes in motion graphically and mathematically predicts future movement.

MYP Global Context:
Scientific and Technical Innovation

Approaches to Learning Skills:

Research Skills
Thinking Skills
Collaboration Skills
Communication Skills

Disciplinary Core Ideas: (KNOWLEDGE & SKILLS)

Vector Components
Adding Vectors Graphically
Adding Vectors Mathematically
Projectile Motion
Centripetal Motion

Crosscutting Concepts: (KNOWLEDGE & SKILLS)
Cause & Effect (CC)
Stability & Change (CC & MYP)
Systems & System Models (CC & MYP)
Patterns (CC)

MYP Key and Related Concepts:
Select one Key Concept:
Cause & Effect (CC)

Select one or more RC:

Movement & Energy

Systems & System Models (CC & MYP)

Possible Preconceptions/Misconceptions: (REFLECTION – PRIOR TO TEACHING THE UNIT)

Students might not have prior knowledge about basic trig functions of sine, cosine, tangent, and Pythagorean theorem needed for adding vectors mathematically. Take time to review.
An object shot horizontally has no velocity in y axis thus will hit the ground at the same time as one dropped. Often students believe the one shot will hit the ground first.
Students might not recognize that centripetal acceleration goes towards the center of the circle. They are used to feeling pushed the opposite way that a car turns and do not understand this is from Newton's 1st law.

Key Vocabulary: (KNOWLEDGE & SKILLS)

Vector Component
Resultant Vector

Constant Velocity
Free Fall
Centripetal Acceleration
Tangential

Inquiry Questions:

Factual

Which direction does an object's velocity and acceleration point when moving in circular motion?
What mathematical operations can be used to determine the x and y components of a vector?

Conceptual

How does an object in projectile motion move in the x and y axis?
How can vectors be added graphically?
How can vectors be added mathematically?
Would a dropped or horizontally launched object hit the ground first?

Debatable

What demonstrations/experiments could be run that would support the concepts of addition of vectors?

MYP Objectives	Summative assessment	
MYP A MYP D	Assessment Task: 2D Summative Test: MYP A/D	Relationship between summative assessment task(s) and statement of inquiry: The assessment measures how well students determine vector quantities using graphical and mathematical through analysis. Conceptual understanding of the types of motion in projectile motion is tested as well as problem solving for projectile and centripetal acceleration.
Unit Objectives: 2D Motion Need to Know - https://docs.google.com/document/d/17QhqtpgueY-WrWUi1VCPdXrcMFWG0u4ab3OoUqiUv3k/edit?usp=sharing		

Learning Activities and Experiences	Inquiry & Obtain: (LEARNING PROCESS)	Evaluate: (LEARNING PROCESS)	Communicate: (LEARNING PROCESS)
Week 1:	Students will analyze and measure the vector components of a trip through a city graphically.	Students solve for vector components graphically by counting out the components to scale.	Students create whiteboards showing their work to determine the addition of vectors graphically. They compare their results against the setup in class.
Week 2:	Students will analyze and measure the vector components of a trip through a city using trig functions	Students solve for where a boat would land on an opposing shore as it crosses a river.	Students create whiteboards showing their work to determine the location that a boat would land on an opposing shore.
Week 3:	Students observe a ball dropped and a ball launched to discuss conceptually what is projectile motion. Students take measurements for objects launched (time and range).	Students use the equations from projectile motion to predict where an object launched horizontally will land.	Students show work on a whiteboard predicting where a horizontally launched object will land and test their prediction using the projectile motion launchers.
Week 4:	Students examine a centripetal force set up with a stopper spinning causing a mass to be held up.	Students calculate the needed force to hold a mass up with a spinning stopper.	Students create whiteboards showing their work calculating the needed force to hold a mass up with a spinning stopper and compare their results with the actual mass.

Week 5: Remediation	Students complete a review quiz to diagnose strengths and weaknesses in the content.	Students complete review activities based upon quiz results.	

Resources (hyperlink to model lessons and/or resources): (click here for description)

Discovery Education Science Techbook
2D Motion Schoology Unit: https://marietta.schoology.com/group/1606049999/materials#/group/1606049999/materials?f=63015431

Reflection: Considering the planning, process and impact of the inquiry

Prior to teaching the unit	During teaching	After teaching the unit