Unit 5: Waves and Their Application (Physical Science)

Content Area: **Science**
Course(s): **Science Gr. 6**
Time Period: **MayJun**
Length: **35 Days**
Status: **Published**

Title Section

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Science: Grade 6

Unit 5: Waves and Their Applications

Belleville Board of Education

102 Passaic Avenue

Belleville, NJ 07109

Prepared by: Ms. Deborah Siipola

Dr. Richard Tomko, Ph.D., M.J., Superintendent of Schools

Ms. LucyAnn Demikoff, Director of Curriculum and Instruction K-12

Ms. Nicole Shanklin, Director of Elementary Education

Mr. George Droste, Director of Secondary Education

Board Approved: September 23, 2019

Unit Overview

In Unit 5, students will:

- develop an understanding that waves are evergy traveling through matter, ina repaetong patern.
- use terms such as wavelenght, freguency,and amplitude to describe the properties of waves.
- explore how the type of media a wave travels through affects the properties of a wave.
- gather evidence on the unique proerties of light to determine how humans percieve color and brightness.
- examine refraction and reflection at the boundry of two media.
- explain refraction, tranmission, or absorbtion of light through different materials.
- explain how elcetromagnetic waves are used and modified to carry information for communication.
- explore differences between analog and digital signals to evaluate the reliability of these signals.
- analyze advancements in communicsation technology in relation to advancements in science.

Enduring Understanding

At the conclusion of Unit 5, all students will understand that:

- All waves have a repeating pattern with a specific wavelength, frequency, and amplitude.
- Sound waves need matter to travel through.
- a light wave will be relflected, refracted, or absorbed by an object, depending on the object's material and the light wave's frequency.
- light waves traqvel in straight lines except at the surface of different transpparent materials, where the light path bends.
- development of technology and advances in science are mutually supportive in driving innovation in both fields.
- wave models are useful in explaining all f the properties and behaviors of light.
- light can travel through space it can not be a matter wave.
- digital signals are more reliable way to encode information than analog.

Essential Questions

- How does energy move about the universe?
- How does the way light waves interact with materials allow us to perceive our surroundings?
- Compare and contrast echoes and reflections.
- How can we distinquish different sounds and colors?
- How do electric devices send and recieve infrmation?
- How do waves get "sent" and "received"?
- How has wireless technology changed our society ad where will it take us in the future?
- What scientific concepts do we need to understand to overcome the challenges of designing systems to send and receive wave information?

Exit Skills

Upon completion of Unit 5 Waves and their Application, students will be able to:

- differentiate bewteen waves and other phenomena.
- analyze models to identify patterns of waves.
- compare and contrast transverse and longitudinal waves.
- use charts and graphs to present data on amplitude and frequency of waves.
- generate mechanical waves to describe wave properties.
- use knowledge of wave properties t explain how the amplitude of a wave decreases as it travels over a large area.
- apply their understanding wave properties to explain how an ultrasound machine prduces visual images.
- describe how light waves contribute to a beautiful sunset or sunrise.
- use mathmateical thinking to explore relationship between a wave's energy and frequency and the resulting effects on living things.
- use models to interpret the relationship between a wave's energy and its amplitude.
- integrate scientific and technical information about waves and wave application.
- use text in media and visual displays to compare types of mdulation.
- evaluate different models to determine if information being shared is analog or digital.

New Jersey Student Learning Standards (NJSLS-S & NGSS)

SEP - Developing and Using Models

SEP - Analyzing and Interpreting Data

SEP - Using Mathematics and Computational Thinking

SEP - Obtaining, Evaluating, and Communicating Information

SEP - Scientific Knowledge is based on Empircal Evidence

DCI - Wave Properties

DCI - Electromagnetic Radiation

DCI - Information Technologies and Instrumentation

CCC - Patterns

CCC - Scale, Proportion, and Quantity

CCC - Systems and System Models

CCC - Energy and Matter

CCC - Structure and Function

CCC - Stability and Change

CCC - Influence of Science, Engineering, and Technology on Society and the Natural World

CCC - Science is a Human Endeavor

NextGen Science Standards

6-8.MS-PS2-1	Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
6-8.MS-PS4-3	Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.
6-8.MS-PS2-2	Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

Interdisciplinary Connections

Complete Do the Math! sections embedded within the Unit

Math: 6.RP.A.1

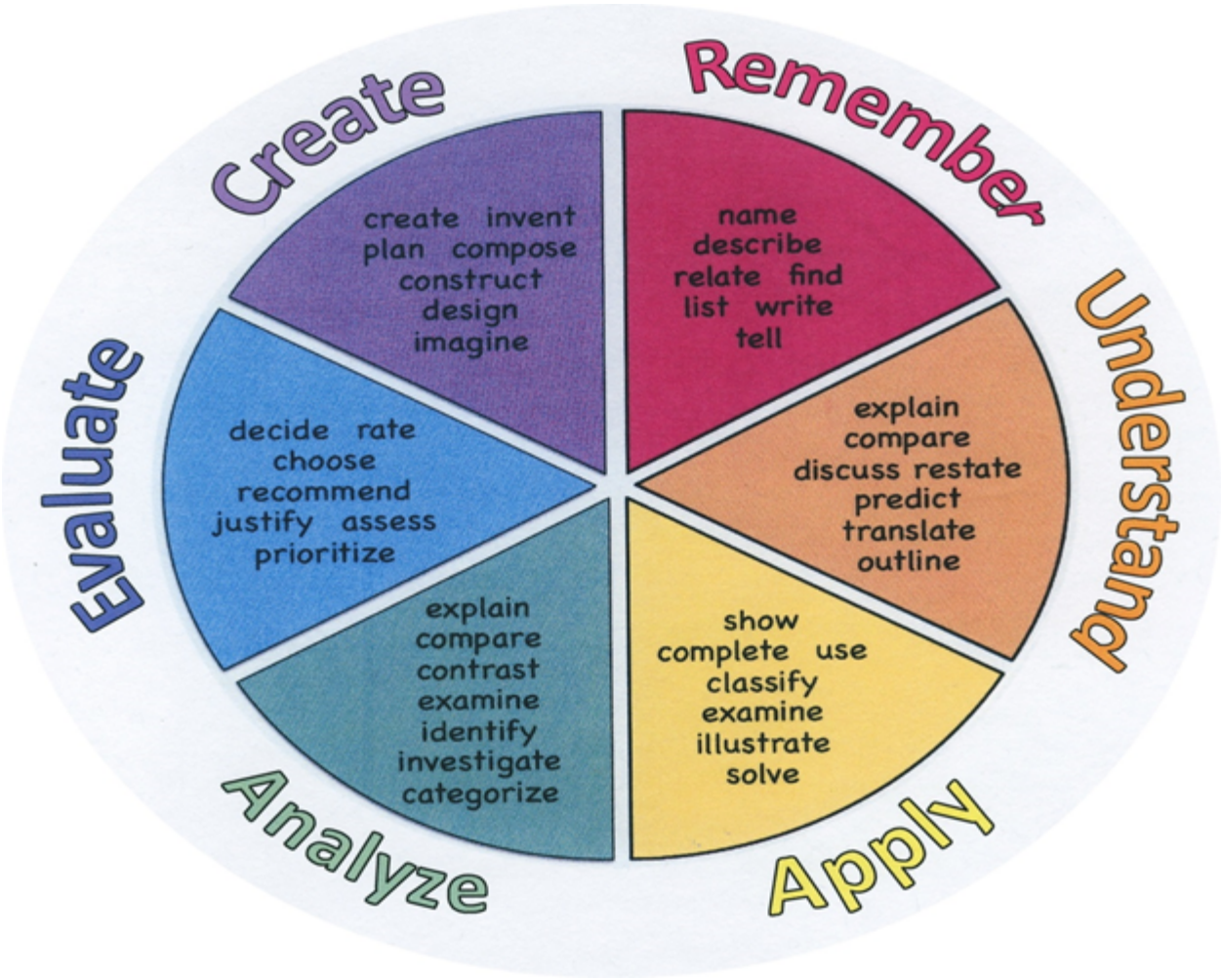
ELA: SL.8.5

Learning Objectives

At the conclusion of Unit 5, students will be able to:

- recognize that a simple wave has a repeating patern.
- differntiate bewteen longitudinal and transverse waves.
- explain the measurable properties of a wave amplitude, frequency, and wavelenght.
- correlate the behavior of waves to the properties of waves.
- describe the behavior of waaves and particles through different types of materials.
- model and graph the amplitude of a wave in realtion the distance it travels.
- analyze the reflection of waves at the boundry of two media.
- model the properties of waves in relation to how they correspnd to properties of light.
- detremine why light does not need to travel through matter.
- express te relationship between wavelength, frequency, and amplitude in mathmatetical models.
- recognoze patterns in data between the brghtness of light and specific amplitude.
- evaluate how structure affects interactations between light and matter.
- synthesize knowledge of signals and waves to explain how waves can be designed to carry signals.
- compare and contrast. and evaluate the reliabilty of analog and digital signals.
- discover how the structure of a wave can be designed to encode and trnsmit information.
- analyze the ways in which communcications are used in technology.
- design a telephone timeline to illustrate how telephone technology transformed with scientific advancement.

Remember	Understand	Apply	Analyze	Evaluate	Create
Choose	Classify	Choose	Categorize	Appraise	Combine
Describe	Defend	Dramatize	Classify	Judge	Compose
Define	Demonstrate	Explain	Compare	Criticize	Construct
Label	Distinguish	Generalize	Differentiate	Defend	Design
List	Explain	Judge	Distinguish	Compare	Develop
Locate	Express	Organize	Identify	Assess	Formulate
Match	Extend	Paint	Infer	Conclude	Hypothesize
Memorize	Give Examples	Prepare	Point out	Contrast	Invent
Name	Illustrate	Produce	Select	Critique	Make
Omit	Indicate	Select	Subdivide	Determine	Originate
Recite	Interrelate	Show	Survey	Grade	Organize
Select	Interpret	Sketch	Arrange	Justify	Plan
State	Infer	Solve	Breakdown	Measure	Produce
Count	Match	Use	Combine	Rank	Role Play
Draw	Paraphrase	Add	Detect	Rate	Drive
Outline	Represent	Calculate	Diagram	Support	Devise
Point	Restate	Change	Discriminate	Test	Generate
Quote	Rewrite	Classify	Illustrate		Integrate
Recall	Select	Complete	Outline		Prescribe
Recognize	Show	Compute	Point out		Propose
Repeat	Summarize	Discover	Separate		Reconstruct
Reproduce	Tell	Divide			Revise
	Translate	Examine			Rewrite
	Associate	Graph			Transform
	Compute	Interpolate			
	Convert	Manipulate			
	Discuss	Modify			
	Estimate	Operate			
	Extrapolate	Subtract			
	Generalize				
	Predict				



Suggested Activities & Best Practices

From HMH Curriculum Activities:

- Engage: Lesson Phenomenons
- Explore/Explain: Hands on Labs and Engineer It
- Unit Projects
- Unit Performance Tasks

From Defined Stem:

- Performance Tasks
- Literacy Tasks
- Constructed Response

Assessment Evidence - Checking for Understanding (CFU)

- Admit Tickets
- Compare & Contrast
- Create a Multimedia Poster
- DBQ's
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- HMH End-of-Year Test (Benchmark)
- HMH Mid-Year Test (Benchmark)
- HMH Performance-based Assessment (Alternative)
- Illustration
- Journals
- KWL Chart
- Learning Center Activities
- Multimedia Reports
- Outline
- Question Stems
- Quickwrite
- Quizzes (Formative)
- Red Light, Green Light
- Self- assessments
- Study Guide
- Surveys
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Unit review/Test prep
- Unit tests (Summative)
- Web-Based Assessments
- Written Reports

Primary Resources & Materials

HMH Science Dimensions: Teacher Edition, Student workbooks, online resources

HMH Equipment & Safety Kits

Ancillary Resources

Science Weekly, Scholastic News, NewsELA, YouTube/TeacherTube, National Geographics Kids, Science Channel

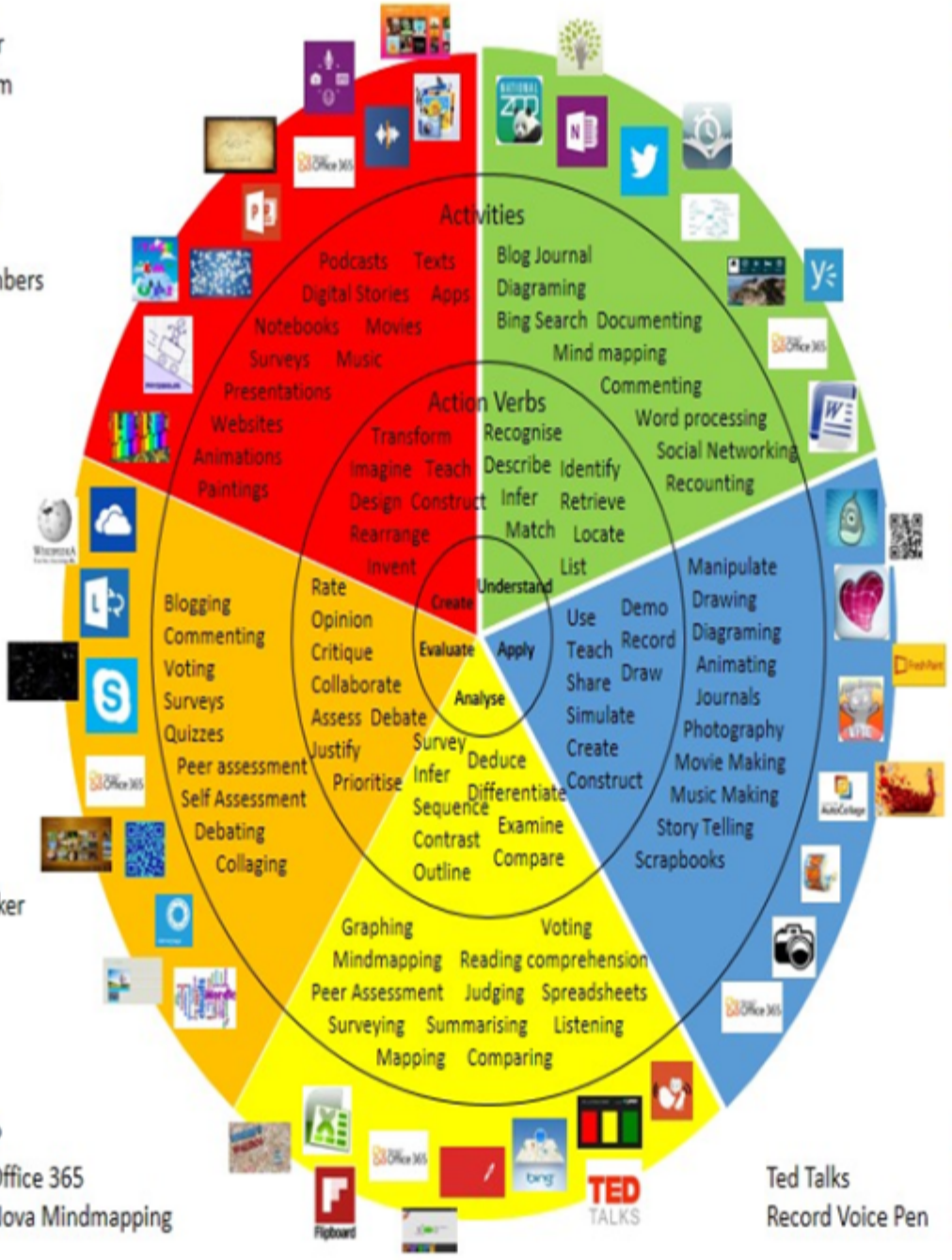
Technology Infusion

- Discovery Education video streams
- YouTube video streams
- BrainPOP video streams
- Khan Academy

Win 8.1 Apps/Tools Pedagogy Wheel

Podcasts
Photostory 3
Kid Story Builder
Music Maker Jam
Paint A Story
Office 365
MS PowerPoint
Stack 'Em Up
NqSquared Numbers
Physamajig
Xylophone 8

Wikipedia
Skydrive
Lync
SkyMap
Skype
Office 365
Puzzle Touch
Easy QR
Memorylage
Life Moments
Word Cloud Maker



Where's Waldo?
MS Excel
Flipboard
Office 365
Nova Mindmapping

Ted Talks
Record Voice Pen

Originally taken from http://www.coetail.com/vzimmer/files/2013/02/iPadagogy-Wheel.001.jpg
And adapted for Windows 8.1 devices by Charlotte Beckhurst @CharBeckhurst

Alignment to 21st Century Skills & Technology

Mastery and infusion of **21st Century Skills & Technology** and their Alignment to the core content areas is essential to student learning. The core content areas include:

- English Language Arts;
- Mathematics;
- Science and Scientific Inquiry (Next Generation);
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics;
- World languages;
- Technology;
- Visual and Performing Arts.

CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP5.1	Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

21st Century Skills/Interdisciplinary Themes

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving

- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

21st Century Skills

- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

Differentiation

Differentiations:

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Token economy
- Study guides
- Teacher reads assessments allowed
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Story guides
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Assistive technology
- Auditory presentations
- Large print edition
- Dictation to scribe
- Small group setting

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Choice boards
- Games and tournaments

- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Learning contracts
- Leveled rubrics
- Literature circles
- Multiple intelligence options
- Multiple texts
- Personal agendas
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products
- Varying organizers for instructions

Lo-Prep Differentiations

- Choice of books or activities
- Cubing activities
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share
- Reading buddies
- Varied journal prompts
- Varied supplemental materials

Special Education Learning (IEP's & 504's)

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes

- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multi-sensory presentation
- multiple test sessions
- preferential seating
- preview of content, concepts, and vocabulary
- Provide modifications as dictated in the student's IEP/504 plan
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

English Language Learning (ELL)

- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarif
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student’s learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher’s notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

At Risk

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

Talented and Gifted Learning (T&G)

- Above grade level placement option for qualified students
- Advanced problem-solving
- Allow students to work at a faster pace
- Cluster grouping
- Complete activities aligned with above grade level text using Benchmark results
- Create a blog or social media page about their unit
- Create a plan to solve an issue presented in the class or in a text
- Debate issues with research to support arguments
- Flexible skill grouping within a class or across grade level for rigor
- Higher order, critical & creative thinking skills, and discovery
- Multi-disciplinary unit and/or project
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Utilize exploratory connections to higher-grade concepts
- Utilize project-based learning for greater depth of knowledge