Unit 3 Best Flying Practices and Part 107 Regulations

Content Area: **STEM**
Course(s): **Intro to Drone Flying**
Time Period: **JanFeb**
Length: **40 days**
Status: **Published**

Title Section

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

INTRODUCTION TO DRONE FLYING, GRADES 10 TO 12

BEST FLYING PRACTICES AND PART 107 REGULATIONS

Belleville Board of Education

102 Passaic Avenue

Belleville, NJ 07109

Prepared by: CHRISTINE PUCCIO

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 K-8

Mr. George Droste, Director of Secondary Education

Board Approved:

Unit Overview

- This unit explains the best ways for owners to maintain their drones.
- Drone operators have specific planning activities and procedures to follow after each flight.
- Drone operators must know what to do in the case of an emergency, like losing the link to the aircraft.
- In order to encourage a positive attitude towards drones, operators must deal with spectators in a professional manner.
- There are Part 107 Regulations that drone operators must be familiar with in order to obtain a commercial drone license.
- The main roles of a crew member are the RPIC, VO, and person manipulating the controls. Additional roles can be added if necessary.
- The RPIC, or Remote Pilot in Command has the most responsibility and is the final authority of a drone mission.
- Drone operators must report any serious property damage (in excess of $500) and serious injuries (requiring hospitalization).
- There are specific limitations of drone pilots when operating from moving vehicles, operating over people, and operating at night.
- No crew member, under any circumstance should operate when physically or mentally impaired.
- Waivers can be requested if any drone operator must deviate from a Part 107 regulation.

Enduring Understanding

- Drone owners must maintain drones by replacing batteries, propellers, and motors on a regular basis.
- The RPIC must inspect the drone, its associated equipment, and the mission location before each flight.
- There is a RTH (return to home) function that can be used in emergency situations.
- This RTH function is only effective if the home location is updated for each mission.
- If the GPS of a drone control system stops working, the operator must be prepared to manually bring it to safety.
- There should be a visual observer to engage with spectators, and the operating site should be blocked off so that only crew members can enter it.
- There are sample Part 107 examination questions on the internet to help drone pilots prepare for the commercial license examination.
- Missions will be conducted more safely if each crew member has a specific role, and no one has too much to do.
- Property damage (over $500 to repair or replace) and serious injuries (requiring hospitalization) must be reported within 10 days.
- There are specific regulations regarding operation from moving vehicles (land or sea only), operations over people (in sparsely populated areas), and operations at night (within 30 minutes of sunrise/sunset with anticollision lighting).
- Waivers can be requested to deviate from a Part 107 regulation, but they will only be accepted if the operations are proven to be safely conducted.
- No crew member can be physically or mentally impaired during a mission, and any FAA, TSA, or law enforcement official has the right to inspect any property or personnel.

Essential Questions

- What are some things that owners should do in order to guarantee safety when flying their drones?
- What practices are considered drone maintenance?
- Name some examples of emergency situations when flying a drone.
- What actions can be done in the case of emergency situations?
- Why is it important to have backup plans for bringing a drone to safety?
- How would a mission affect the choice of types of crew members needed?
- What is considered property damage/serious injury, and how should they be handled?
- What actions should be taken to keep spectators comfortable, and to prevent them from affecting a mission?
- What types of drone missions may require a waiver?

- What officials' requests should crew members unconditionally comply with?

Exit Skills

1. By the end of Unit 3, the student should be able to:

- Identify the parts of a drone that need to be inspected/replaced in its maintenance.
- Know the signs of an emergency situation when flying a drone.
- Understand how to use the RTH (Return to Home) function in the case of an emergency situation.
- Understand how to manually bring a drone to safety, in case the GPS is not functioning properly.
- Know the signs of a low battery when flying a drone.
- Name the types of crew members that can be used in a mission, and explain their roles.
- Identify property damage/serious injury that is necessary for a report to the FAA.
- Set up a mission and delegate responsibility to minimize spectator interference with the flight.
- Determine whether or not a waiver application would need to be completed for a mission.
- Be aware of the people who have the right to inspect your drone, certification, and crew members.

New Jersey Student Learning Standards (NJSLS-S)

HS-PS4-2	Evaluate questions about the advantages of using a digital transmission and storage of information.
HS-PS4-5	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.
HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity.
HS-ESS3-6	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity (i.e., climate change).
HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
SCI.HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
SCI.HS-PS2-1	Analyze data to support the claim that Newton's second law of motion describes the

	mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
SCI.HS-PS2-2	Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

Interdisciplinary Connections

MA.K-12.5	Use appropriate tools strategically.
MA.N-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
LA.SL.11-12.4	Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience.
LA.L.11-12.6	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
TECH.8.1.12.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
TECH.8.1.12.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
TECH.8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
TECH.8.2.12.B.CS1	The cultural, social, economic and political effects of technology.
TECH.8.2.12.D.CS2	Use and maintain technological products and systems.

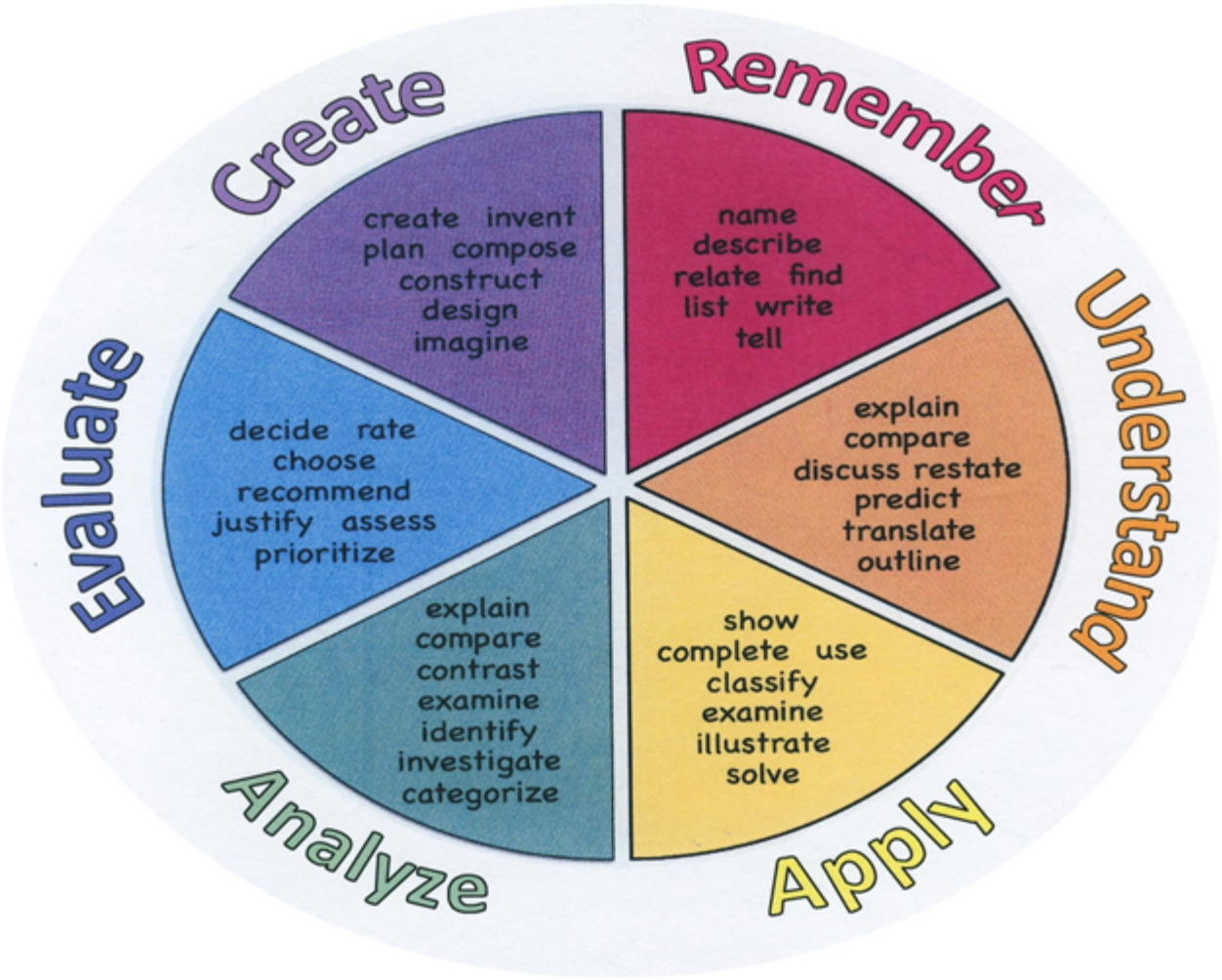
Learning Objectives

- Use the manufacturer recommendations to devise an effective drone maintenance schedule.
- Determine the signs of an in-flight emergency.
- Use the RTH (return to home) function to land a drone.
- Demonstrate proper manipulation of flight controls to move and land a drone when there is no functioning RTH or GPS.
- Devise an appropriate crew list, depending on the type of mission and its location.
- Judge whether or not a mission would require a waiver application or damage report to the FAA.
- Distinguish which people have the right to inspect property/personnel from those who do not.
- Explain the limitations of drone pilots when operating from a moving vehicle, operating over people, and operating at night.
- Compare and contrast the basic safety regulations of drones in the Asian countries to the United States.
- Compare and contrast the basic safety regulations of drones in the African countries to the United

States.

Action Verbs: Below are examples of action verbs associated with each level of the Revised Bloom's Taxonomy.

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

Materials:

- Syma XSC-1 2.4G drone
- FS-i6S drone simulator

Best Practices:

- Use of scaffolded notes, where students fill in blanks
- Station activities, based on interest and level of understanding
- Hands-on activities to familiarize with parts of a drone and the control station
- Google Classroom organized around units of study

Supplemental Materials:

- faa.gov
- skyop.com
- Various part 107 test prep books
- www.dslrpros.com
- youtube.com
- https://jrupprechtlaw.com/part-107-knowledge-test#Part_107_Practice_Initial_Knowledge_Exam_Quiz

Assessment and Learning:

- edulastic.com
- whiteboard.fi/whiteboard.chat
- Jamboard
- Google Forms
- Google Classroom
- quizizz.com
- oncourse.com

Techniques:

- dronelegends.com
- youcanfly.aopa.org/high-school
- stem.org

Motivation and Mindset:

- dronenodes.com/how-to-fly-a-quadcopter-beginner-guide
- youtube.com (Katia's Buzz TV, Tony & Chelsea Northrup, Altitude University, Peter Rulon)

Assessment Evidence - Checking for Understanding (CFU)

- Edulastic Formative Assessment (Formative)
- quizizz.com - Teacher Made Topics (Formative)
- skyop.com online quizzes (Formative)
- Benchmarks on OnCourse (Summative/Benchmark)
- "Do Now/Exit Ticket" Activity (Formative)

- Admit Tickets
- Anticipation Guide
- Common Benchmarks
- Compare & Contrast
- Define

- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Illustration
- Journals
- Learning Center Activities
- Multimedia Reports
- Outline
- Question Stems
- Quizzes
- Self- assessments
- Study Guide
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Unit review/Test prep
- Unit tests
- Web-Based Assessments
- Written Reports

Primary Resources & Materials

Upon completion of this section, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not needed or used.

Please list all district-provided Primary Resources & Materials and/or those outside that are accessed with district resources.

Ancillary Resources

Upon completion of this section, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not not needed or used.

Please list all additional resources that will be used to strengthen this unit's lessons.

Technology Infusion

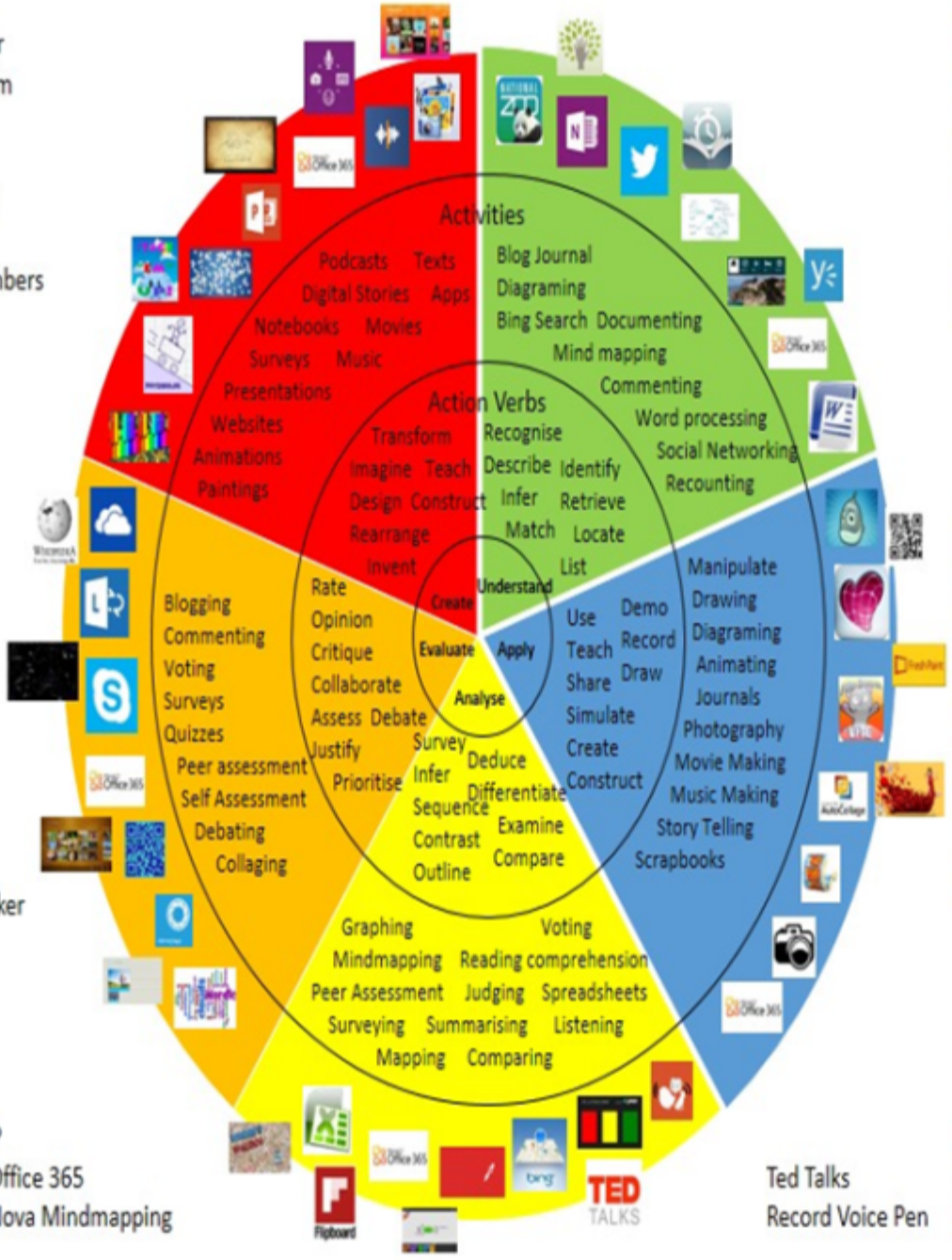
Upon completion of this sections, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not needed or used.

What **Technology Infusion** and/or strategies are integrated into this unit to enhance learning? Please list all hardware, software and strategies. Please find a technology pedagogy wheel for assistance while completing this section.

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 Office 365
Flipboard 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

- English Language Arts;
- Mathematics;
- Science and Scientific Inquiry (Next Generation);
- Technology;

21st Century Skills/Interdisciplinary Themes

Please list only the **21st Century/Interdisciplinary Themes** that will be incorporated into this unit.

- 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

Please list only the **21st Century Skills** that will be incorporated into this unit.

- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy

Differentiation

Differentiations:

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions

- Center-based instruction
- Study guides
- Teacher reads assessments allowed
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Assistive technology
- Auditory presentations
- Small group setting

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Choice boards
- Games and tournaments
- Learning contracts
- Leveled rubrics
- Multiple intelligence options
- Project-based learning
- Problem-based learning
- Stations/centers
- Tiered activities/assignments
- Tiered products

Lo-Prep Differentiations

- Choice of books or activities
- Flexible grouping
- Goal setting with students
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share
- 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
- 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 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 clarify
- 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 work presented or required
- having peers take notes or providing a copy of the teacher’s notes
- providing study guides
- tutoring by peers
- using computer word processing spell check and grammar check features

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 work presented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- providing study guides
- tutoring by peers
- using authentic assessments with real-life problem-solving
- 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
- 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

Sample Lesson

Using the template below, please develop a **Sample Lesson** for the first unit only.

Unit Name:

NJSLS:

Interdisciplinary Connection:

Statement of Objective:

Anticipatory Set/Do Now:

Learning Activity:

Student Assessment/CFU's:

Materials:

21st Century Themes and Skills:

Differentiation/Modifications:

Integration of Technology: