# Unit 2 Drone Flight Training

Content Area: **STEM**
Course(s): **Intro to Drone Flying**
Time Period: **NovDec**
Length: **30 days**
Status: **Published**

## Title Section

## Department of Curriculum and Instruction

**Belleville Public Schools**

**Curriculum Guide**

# INTRODUCTION TO DRONE FLYING, GRADES 10 TO 12

# DRONE FLIGHT TRAINING

**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 will introduce the student to the flight simulator, the Syma drone, and the Tello drone.
- It shows basic, intermediate, and advanced exercises that can be done with each of them.
- It gives students the opportunity to work at their own pace and improve their skills for each exercise.
- The simulator has different scenarios for the students to fly in.
- For the drones, there are both vertical and horizontal obstacles that can be combined into courses for students to practice.

## Enduring Understanding

**Enduring understandings**:

- Simulators allow drone pilots to practice landing, turns and other maneuvers when there is a lack of space or the weather conditions are not ideal.
- Simulators give allow drone pilots to get evaluated on their ability to complete specific skills.
- Simulators provide drone pilots an easy change of scenery without using additional equipment.
- Tello drones are good for beginners to use, because of its ability to remain in one position while the pilot is deciding what to do next.
- Tello drones require the use of a bluetooth connection in order to operate.
- Students who use Tello drones will be able to see a first person view of their flight.
- Syma drones are more difficult for drone pilots to use because of their inability to remain in a fixed position.
- Because of this, Syma pilots must be able to think fast and make extremely precise moves.
- When using Syma controllers, pilots need to be very careful in making gentle movements to avoid hitting the ceiling or flying too rapidly in a specific direction.

## Essential Questions

- What effect do speed and altitude have on the simulator pilot's ability to land?
- What strategies have you learned to achieve high evaluations on each of the simulator skills?
- What skills do you think are the most difficult to perform on the simulator?
- What are the advantages/disadvantages of Tello drones over Syma drones?
- In what ways do you think that the simulator resembles the Tello drone?
- In what ways do you think that the simulator resembles the Syma drone?
- What strategies have you learned to fly smoothly and precisely on the Tello and Syma drones?
- What suggestions would you use to teach drone flying to a beginner drone operator?

## Exit Skills

By the end of Unit 2, the student should be able to:

- Use a drone flight simulator for vertical movement, horizontal movement, and landing.
- Connect a Tello drone to a phone with wifi.
- Pair a Bluetooth remote to a Tello drone.
- Pair a Syma drone with a remote controller.
- Change and charge the batteries of both a Syma and a Tello drone.
- Use the yaw, pitch, throttle, and roll of a Tello drone, for vertical movement, horizontal movement, and landing maneuvers.

- Use the yaw, pitch, throttle, and roll of a Syma drone, for vertical movement, horizontal movement, and landing maneuvers.
- Fly through horizontal and vertical obstacles with the Syma, Tello, or both drones.

## New Jersey Student Learning Standards (NJSLS-S)

| | |
|---|---|
| SCI.HS-PS4-2 | Evaluate questions about the advantages of using a digital transmission and storage of information. |
| SCI.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. |
| SCI.HS-ESS2-2 | Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. |
| SCI.HS-ETS1-2 | Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. |
| SCI.HS-ETS1-4 | Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. |
| 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. |
| 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. |

## 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. |
| MA.K-12.6 | Attend to precision. |
| MA.N-Q.A.3 | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. |
| 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.A.CS2 | Select and use applications effectively and productively. |
| TECH.8.1.12.D.CS1 | Advocate and practice safe, legal, and responsible use of information and technology. |

| | |
|---|---|
| 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.8.2.12.D.CS2 | Use and maintain technological products and systems. |

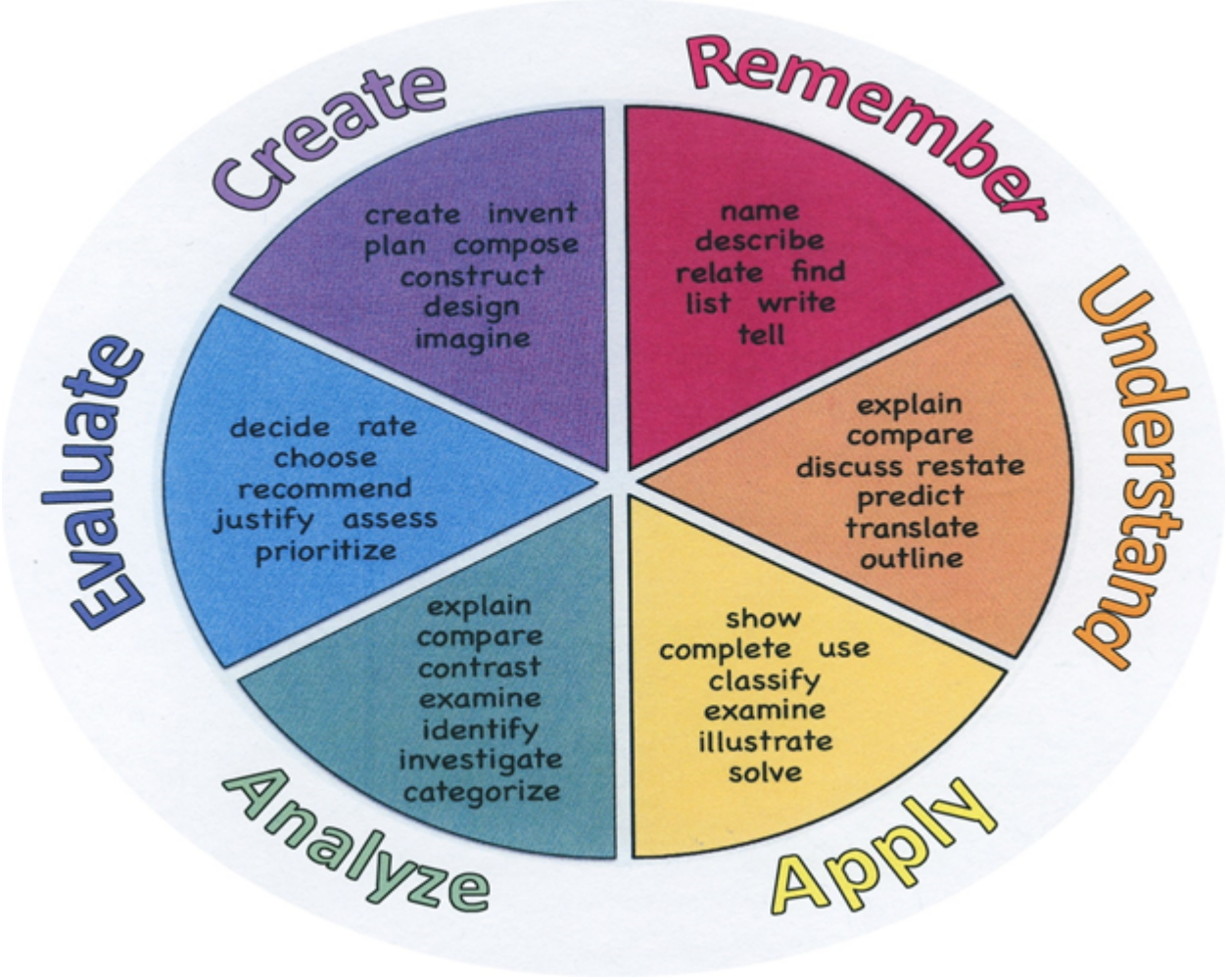
## Learning Objectives

- Point out the weather conditions that would be least optimal for drone use.
- Explain the strategies and controller motions that are used for landing, turning, etc. when flying with the simulator.
- Compare and contrast flight with the Syma drone to flight with the Tello drone.
- Explain what first-person view is, and how it can be used when operating the simulator and the Tello drone.
- Assess your connection of the Tello drone to wifi, and conclude what needs to be done to correct any problems.
- Detect whether or not there is a connection between the Tello drone and the Bluetooth remote.
- Operate a drone and a simulator by manipulating the controller to use the yaw, pitch and roll.
- Develop a plan to have the maximum number of batteries available for use during flight.
- Design an obstacle course for drone flight with horizontal and vertical obstacles.
- Identify 2 black-owned drone training companies, and compare the instruction content that they offer.

**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<br>Generalize<br>Predict | Subtract | | | |




## 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

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 (DRONER TECH, URV Coach, etc.)

## 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

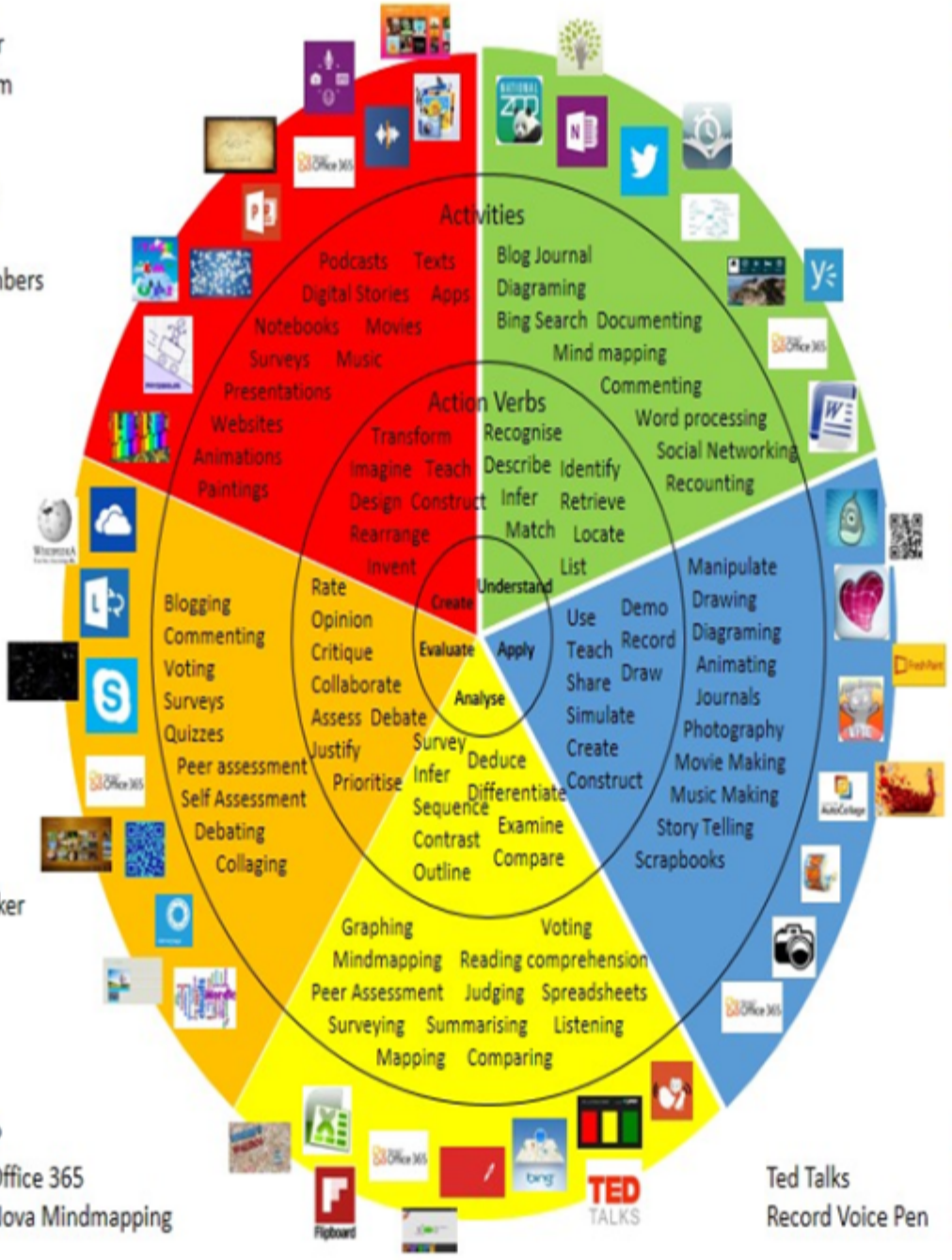
Upon completion of this sections, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not needed or used.

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
- multiple test sessions
- multi-sensory presentation
- 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: