Unit 5: Weather and Additional Topics

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Belleville Public Schools

Curriculum Guide

INTRODUCTION TO DRONE FLYING, GRADES 10 TO 12

WEATHER AND ADDITIONAL TOPICS

Belleville Board of Education

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Board Approved:

Unit Overview

- This unit explains how humidity, temperature and altitude affect flight performance.
- There are weather reports like METARs that drone operators must learn how to interpret.
- Cloud formation can help drone operators decide whether missions should be suspended or postponed.
- The attitudes and physiological conditions of a drone pilot can affect the outcome of a flight.
- Effective management and delegation of crew responsibilities is important to maximize safety and product quality.

Enduring Understanding

Enduring understandings:

- High humidity, high temperature and high altitude can negatively affect the drone's ability to lift.
- METARs and TAFs are weather reports that provide the time period, temperature, dew point, wind speed, atmospheric pressure, and types of clouds.
- Cumulonimbus and standing lenticular altocumulus clouds are an indication of turbulence and dangerous conditions.
- A pilot's tendency to show off, break rules, lack confidence, deny that conditions are dangerous, or rush to complete a mission are considered hazardous attitudes with remedies for each.
- IMSAFE and PAVE are 2 checklists that pilots can use to assess their readiness to fly and the risks involved in doing so.
- Crew Resource Management is the ability to delegate responsibility and keep crew members aware of the situation at all times.
- The sky must be scanned in a systematic manner, with slight overlap of the fields of view.
- Drone pilots must "see and avoid", giving all other aircraft the right of way.

Essential Questions

- What factors can negatively affect the drone's ability to lift?
- What is the difference between a METAR and a TAF?
- What types of clouds are signs of upcoming turbulence and dangerous conditions?
- What does the FAA consider to be "hazardous attitudes"?
- What are the main "hazardous attitudes", and the remedies for each one?
- Which checklists can pilots use to assess their readiness to fly?
- What actions can an RPIC take to display good Crew Resource Management?
- How do you determine who gets the right of way when operating a drone?
- How can a drone operator systematically scan the sky?

Exit Skills

By the end of Grade Unit 5, the student should be able to:

- Determine what temperature, humidity, and air density can have a negative affect on a drone's lifting ability.
- Explain the difference between a METAR and a TAF.
- Identify the clouds that can be signs of upcoming turbulence.
- Identify the side of a mountain/obstacle where dangerous conditions can be found.
- Explain how factors like load and bank angle can affect the performance of a drone.
- Explain what resignation, macho, impulsivity, anti-authority, and invulnerabillity are.
- Identify the antidotes for the hazardous attitudes listed above.
- Explain what Crew Resource Management is, and whether or not a specific action is an example of it.
- Explain at least one method of scanning the sky for obstacles or traffic.
- Explain what IMSAFE and PAVE are, and how they are used to assess flight readiness.

New Jersey Student Learning Standards (NJSLS-S)

SCI.HS-PS1-5	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
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-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.
SCI.HS-ESS3-2	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
SCI.HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on climate change and other natural systems.
SCI.HS-ESS3-5	Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
SCI.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-ETS1-2	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-ETS1-3	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.
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.
CS.9-12.8.1.12.DA.1	Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
HE.9-12.2.3.12.PS.1	Apply a thoughtful decision-making process to evaluate situations and influences that could lead to healthy or unhealthy consequences (e.g., peers, media).
HE.9-12.2.3.12.ATD.1	Examine the influences of drug use and misuse on an individual's social, emotional and mental wellness.
SOC.6.2.12.C.6.d	Determine how the availability of scientific, technological, and medical advances impacts the quality of life in different countries.
SOC.6.3.12.CS3	Collaboratively evaluate possible solutions to problems and conflicts that arise in an interconnected world.

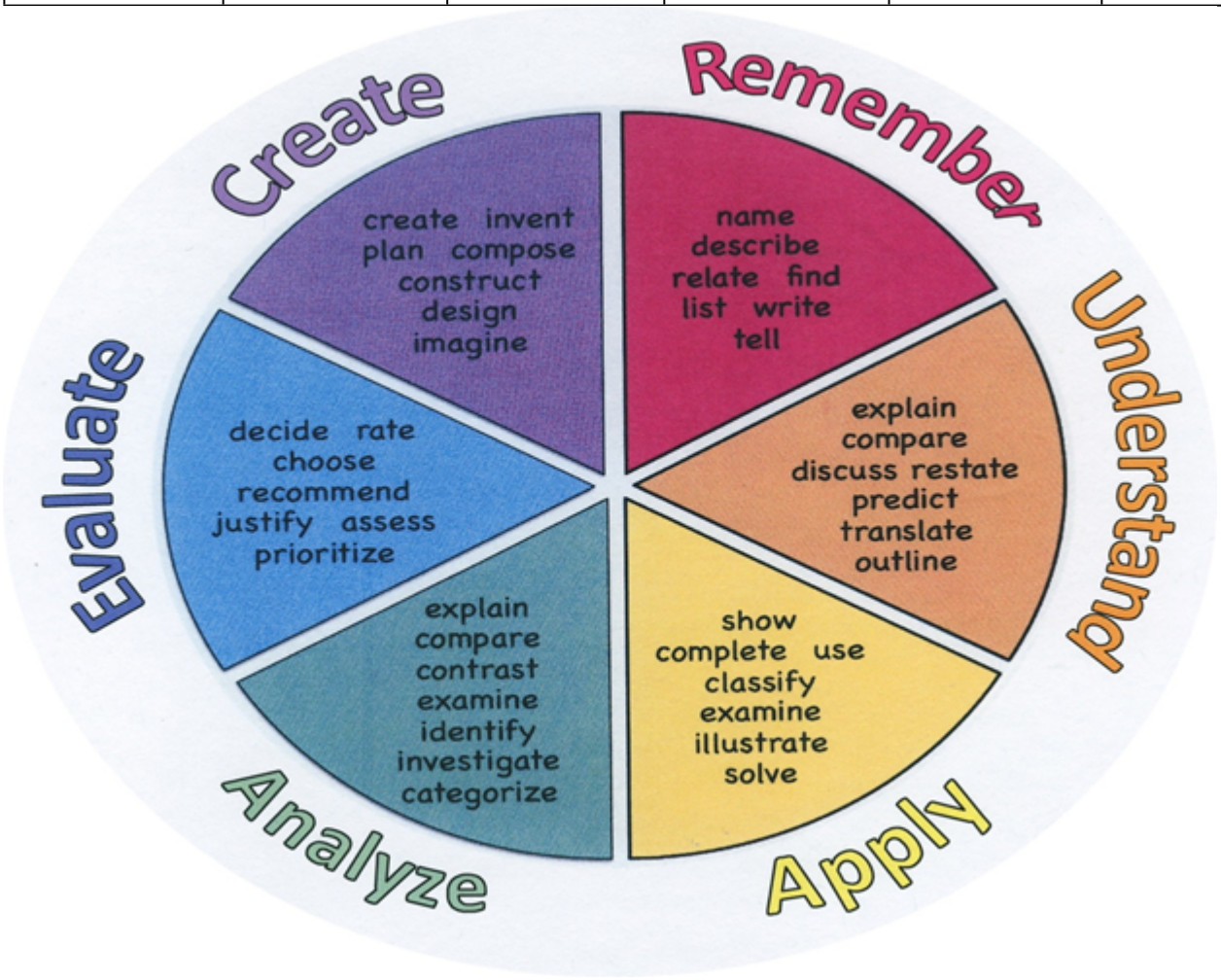
Learning Objectives

- Identify the weather factors that have had adverse effects on wing lift.
- Compare and contrast a TAF to a METAR.
- Name the negative attitudes that a pilot may have and their remedies.
- Distinguish between good and poor Crew Resource Management.
- Illustrate a method for scanning the sky when operating a drone.
- Determine the 2 acronyms used to assess flight readiness and explain what each letter stands for.
- Transform a METAR or TAF into its English language meaning.
- Support your opinion of whether or not flying would be safe, based on your knowledge of clouds and METAR readings.
- Identify the gases in our atmosphere that can affect climate change.
- Explain how China is using drones to create precipitation and judge whether you think that this is a good idea.

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 Recite Select State Count Draw Outline Point Quote Recall Recognize Repeat Reproduce	Indicate Interrelate Interpret Infer Match Paraphrase Represent Restate Rewrite Select Show Summarize Tell Translate Associate Compute Convert Discuss Estimate Extrapolate Generalize Predict	Select Show Sketch Solve Use Add Calculate Change Classify Complete Compute Discover Divide Examine Graph Interpolate Manipulate Modify Operate Subtract	Subdivide Survey Arrange Breakdown Combine Detect Diagram Discriminate Illustrate Outline Point out Separate	Determine Grade Justify Measure Rank Rate Support Test	Originate Organize Plan Produce Role Play Drive Devise Generate Integrate Prescribe Propose Reconstruct Revise Rewrite Transform



Suggested Activities & Best Practices

Best Practices:

- Use of scaffolded notes, where students fill in blanks
- Use of short movie clips, not long films
- 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.
- Repetition and review of concepts, especially sample Part 107 test questions.

Exemplars:

- Continue to have stations, rotating between the simulator and the current content.
- Use drag and drop notes for weather, loading, crew management, and physiology.
- Make graphic organizers with weather factors and whether they create or impede lift.
- Provide a model of a decoded TAF and a decoded METAR to help students interpret other ones.

Assessment Evidence - Checking for Understanding (CFU)

- edulastic.com - for practice exercises and assessment (Formative and Summative)
- whiteboard.fi/ - to present notes and questions (Formative)
- Jamboard - for group work (Formative)
- Google Forms - for Do Nows, Exit Tickets and Assessment activities (Formative)

Performance Task Example (Alternate):

Students research how the China has been using drones to create precipitation.

If no one finds articles, or they are difficult to understand, provide your own translated/highlighted ones.

Students make a short slide presentation or essay of their findings.

- Google Slides - for Notes and Drag and Drop activities (Formative)
- Google Classroom - for open-ended questions (Formative)
- quizizz.com - for content practice in a game format (Alternate)
- oncourse.com - for benchmarks (if applicable) (Summative/Benchmark)

- 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

Materials:

- Syma XSC-1 2.4G drone
- computer or chromebook

Resources:

- skyop.com - readings, notes and films about the drone industry and drone components
- faa.gov - clarifications and justifications of some drone regulations
- https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak - helps explain weather, drone loading, and Aeronautical Decision Making
- https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/media/remote_pilot_study_guide.pdf - reviews Part 107, weather, airspace, Aeronautical Decision Making

Ancillary Resources

- https://www.youtube.com/user/pilottrainingsystem - (Pilot Training System) - For weather, loading and decision making
    - https://www.youtube.com/watch?v=rVABrhwY1lU - Aviation Weather Services
    - https://www.youtube.com/watch?v=ekHambWIcGE - Weather Theory - Part 1
    - https://www.youtube.com/watch?v=S98bpGRgM4E - Weather Theory - Part 2
    - https://www.youtube.com/watch?v=3NhEBYwV2jQ - Loading and Performance
    - https://www.youtube.com/watch?v=66FGKFmsSzU - Decision Making
    - https://www.youtube.com/watch?v=6KJG7HLaDoU - Physiological Factors
- https://www.youtube.com/c/TheDroneCoach - The Drone Coach
    - https://www.youtube.com/watch?v=OcbK9667t3k&t=1398s - Aviation Weather and Effects on sUAS, Density Altitude, Wind
    - https://www.youtube.com/watch?v=imtl6RNTmTU - Aviation Weather Sources, Aerodrome Forecasts, Weather Report
    - https://www.youtube.com/watch?v=aM3wm-3u_hw - sUAS Loading and Performance, Center of Gravity, Loading
    - https://www.youtube.com/watch?v=aLWApSuwUnE - Crew Resource Management, Aeronautical Decision Making
    - https://www.youtube.com/watch?v=FdejaJU0exw - Physiological Factors
- https://www.theguardian.com/news/2021/jan/16/weatherwatch-rainmaking-ganlin-1-china-drone - China and Drones

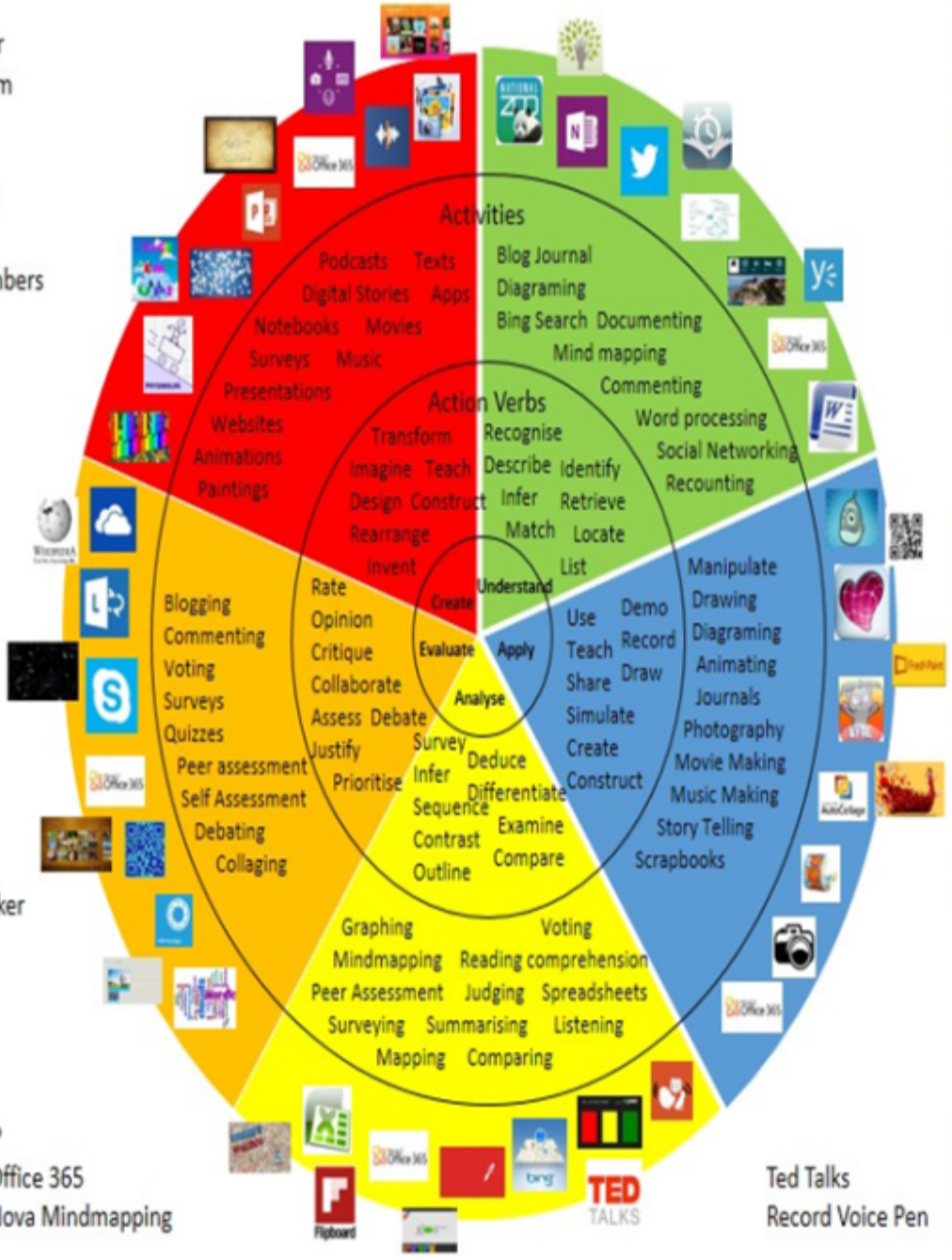
Technology Infusion

- use of the internet - for articles and websites about air pollution and drones
- edulastic.com - for practice exercises and assessment
- whiteboard.fi/ - to present notes and questions
- Jamboard - for group work
- Google Forms - for Do Nows, Exit Tickets and Assessment activities
- Google Slides - for Notes and Drag and Drop activities (Formative)
- Google Classroom - for open-ended questions (Formative)
- quizizz.com - for content practice in a game format (Alternate)
- oncourse.com - for benchmarks (if applicable) (Summative/Benchmark)

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);
- Technology;

WRK.9.2.12.CAP.7	Use online resources to examine licensing, certification, and credentialing requirements at the local, state, and national levels to maintain compliance with industry requirements in areas of career interest.
WRK.9.2.12.CAP.22	Compare risk and reward potential and use the comparison to decide whether starting a business is feasible.
TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
TECH.9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).
TECH.9.4.12.IML.5	Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2).

21st Century Skills/Interdisciplinary Themes

Exemplars:

- Students recognize potentially hazardous attitides that crew members may have during a mission.
- Students interpret weather observations and forecasts by decoding METARs and TAFs.

- 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

Exemplars:

- Students read and discuss articles about China's efforts to combat climate change.
- Students use Aeronautical Decision Making skills to make safe decisions, inform crew members, and delegate responsibilities.

- 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)

Exemplars:

- Allow multiple-choice assignments, written assignments, and quizzes to be submitted late
- Convert articles to PDF and highlight important ideas for students
- Have drag and drop notes so that students do not need to read or write as much
- During drag and drop, discuss information with students so that they understand their notes.
- Have graphic organizers to relate weather factors to propeller lift.
- Have model decoded TAFs and METARs available for students to use when interpreting other ones.

- 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)

Exemplars:

- Have all notes, activity directions, and assessment items translated into Spanish.
- Place students next to Spanish-speaking peers.
- Have individual interaction with students to make sure that they understand the content and expectations.
- Have film clips with subtitles available - show students how to use them.
- Have articles translated to Spanish, if possible.

- 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

Exemplars:

- Minimize the amount of reading that needs to be done.
- Make multi-colored notes, and provide drag/drop notes instead of requiring students to write the information down.
- Show short film clips, and use short lectures because their attention span is short.
- Have graphic organizers to relate weather factors to propeller lift.

- Have model decoded TAFs and METARs available for students to use when interpreting other ones.

- 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)

Exemplars:

- Have students decode difficult TAFs and METARs, even without the model ones to assist.
- Have students illustrate the relationship between weather factors, obstacles, and propeller performance.
- Have students find METARs for Newark Airport and interpret them.

- 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

Unit Name: China and Drones

NJSLS:

Interdisciplinary Connection: English Connection: This lesson incorporates reading scientific literature and written communication.

Statement of Objective: The student should be able to: gather evidence from websites on the internet to see how drones have been used to create precipitation in China.

Anticipatory Set/Do Now: Explain what precipitation is.

Learning Activity: Do Now.

Present articles of drones creating precipitation in China - they can work alone or in groups

Students write their findings as a Performance-Based Assessment in the form of an illustration/slideshow/essay

Students discuss their findings with the class

Student Assessment/CFU's: observation, questioning

Materials: articles on internet, chromebooks/computers, Google Classroom

21st Century Themes and Skills: communication, critical thinking, information literacy

Differentiation/Modifications: try to translate articles to Spanish, have main ideas highlighted for at-risk/IEP students

Integration of Technology: use of the internet, use of Google Classroom, use of chromebooks/computers

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.
SCI.HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on climate change and other natural systems.
CS.9-12.8.1.12.DA.1	Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
SOC.6.2.12.C.6.d	Determine how the availability of scientific, technological, and medical advances impacts the quality of life in different countries.
SOC.6.3.12.CS3	Collaboratively evaluate possible solutions to problems and conflicts that arise in an interconnected world.
TECH.9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).
TECH.9.4.12.IML.5	Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2).