Unit 4 Airports and Airspace

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Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

INTRODUCTION TO DRONE FLYING, GRADES 10 TO 12

AIRPORTS AND AIRSPACE

Belleville Board of Education

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Unit Overview

- This unit shows students the information about airports that can be found on sectional charts and terminal area charts.
- There are different markings to indicate classes of airspace and obstacles.
- There is a legend provided in the Airman Knowledge Supplement that can remind drone operators what each symbol and color represents.
- Airports can be located by latitude and longitude on the different types of charts.
- Information like airport abbreviations, radio frequencies, and altitudes are shown next to airports on these charts.
- Locations can be found by latitude (degrees N or S) and longitude (degrees E or W).
- Runways have different numbers, and are positioned according to the approaching wind.
- Airports can have left pattern or right pattern traffic, as indicated by charts.

Enduring Understanding

Enduring understandings:

- Sectional and Terminal Area charts can be found on skyvector.com, vfrmap.com, and on the FAA website.
- Terminal Area charts show twice as much detail as Sectional charts.
- The Airman Supplement legend can help remind drone operators of the different colors and types of lines used for each airspace class.
- The legend can also explain what obstacle each symbol represents, the altitude of the airport and obstacles, and the radio frequencies used for communication and weather.
- Most of the latitudes and longitudes in the United States are in degrees and minutes west (of the Prime Meridian) and north (of the equator).
- Runways are laid out according to the direction of the wind (in clockwise degrees from magnetic north) approaching them.
- Most airport traffic patterns are left pattern (circling to the left), but the chart will indicate which airports have right pattern traffic (RP).

Essential Questions

- What can be found on Sectional and Terminal Area charts?
- Where can Sectional and Terminal Area charts be found?
- Is there any time where using a Sectional chart is more/less convenient than using a Terminal Area chart?
- How can the Airman Supplement legend be used to help drone operators interpret aeronautical charts?
- How can an aeronautical chart be used to find latitude and longitude?
- What is the difference between left pattern and right pattern traffic?
- How does the type of pattern traffic affect the location of the downwind leg?
- What is the relation to the heading direction and the runway direction?

Exit Skills

By the end Unit 4, the student should be able to:

- Use Sectional and Terminal Area charts to find out basic airport information.
- Use Terminal Area charts and Chart Supplements U.S. to find out additional hazards/activities that may occur near airports.
- Use an aeronautical chart to determine the airspace class, traffic pattern, identifier code, type of tower of an airport.
- Identify which frequencies are used for weather and which are used for pilot communication.
- Use an aeronautical chart to determine the latitude and longitude coordinates of a given location.
- Use an aeronautical chart to determine the floor/ceiling of a given airspace region.
- Use the Airman Supplement legend to determine whether an obstacle's altitude is measured in AGL or MSL.
- Understand the movement of right pattern and left pattern traffic.
- Identify the heading direction and the upwind direction needed to use a given runway.

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-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-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.9-12.8.2.12.EC.1	Analyze controversial technological issues and determine the degree to which individuals, businesses, and governments have an ethical role in decisions that are made.

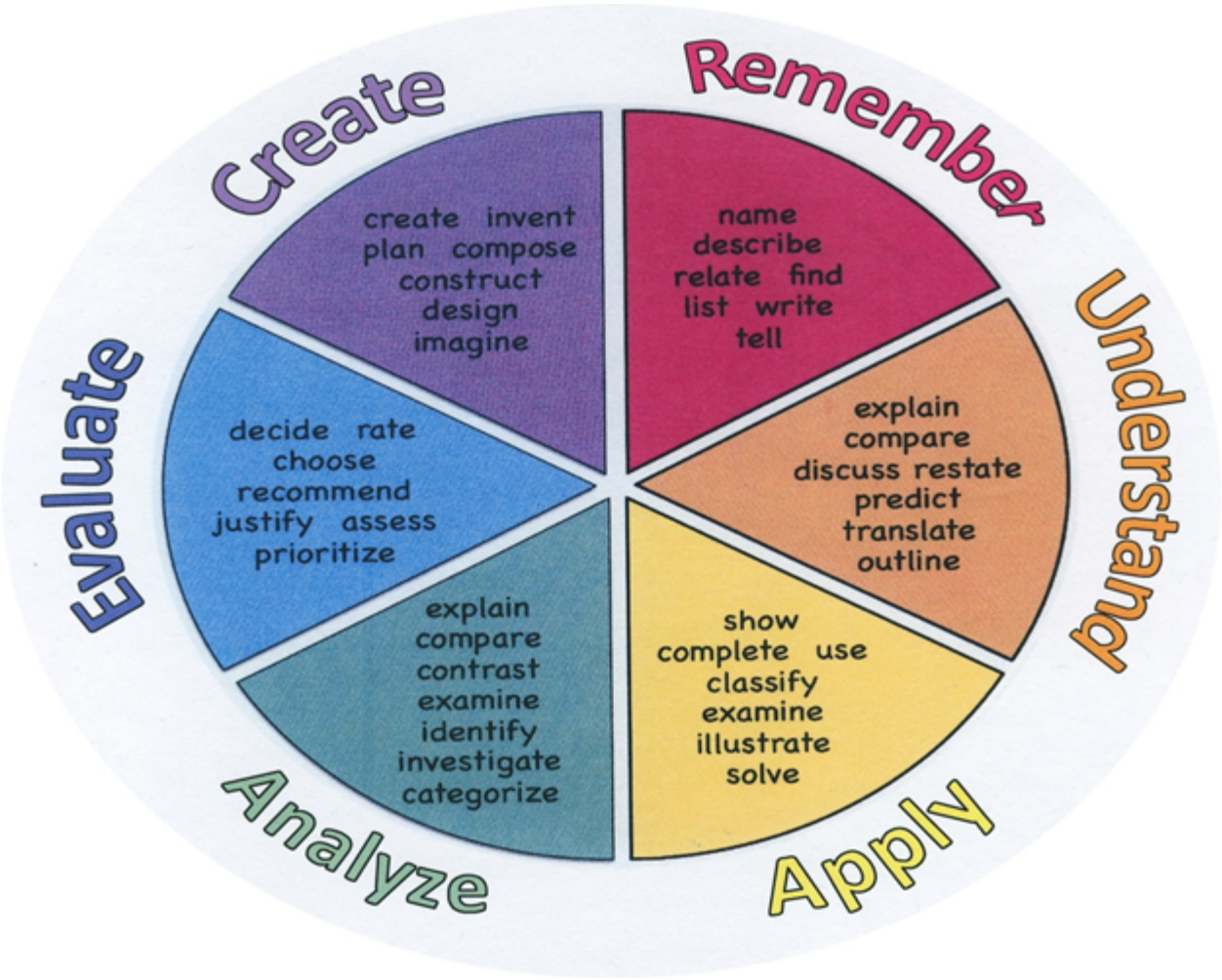
CS.9-12.8.2.12.ITH.3	Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture.
SOC.6.1.12.A.11.e	Assess the responses of the United States and other nations to the violation of human rights that occurred during the Holocaust and other genocides.

Learning Objectives

- Determine the actions that have been taken to minimize noise and air pollution, which improve the quality of air, especially around airports.
- Categorize airports by class and type, by reviewing sectional and terminal area charts.
- Develop a list of activities taking place near airports by reviewing the U.S. Chart Supplements.
- Justify the use of drones to fly over historical sites, like Auschwitz.
- Compare the information and print size of a sectional chart to that of a terminal area chart.
- Calculate the maximum altitude that a drone can fly in an area, given the altitudes of the obstacles.
- Identify the latitude and longitude of an airport, given a small section of an aeronautical chart.
- Calculate the maximum altitude or minimum altitude of a flight class section, given a aeronautical chart.
- Diagram a runway, given the traffic pattern of the airport and runway number.

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

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 between simulator and current content.

- Use drag and drop notes for airmaps and airspace, especially for students who have difficulty following the notes.
- Have a latitude, longitude model for students to use when finding the coordinates of an airport.
- In questions about airmaps, have images of the legend right next to each question.

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):

Read the articles about pollution at airports, and see if drones are contributing to this.

They may need to be translated/highlighted for IEP/ELL students.

Write a short explanation of the pollution and your opinion about whether or not drones are causing or helping pollution.

- 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://skyvector.com/ - has sectional and terminal area charts
- http://vfrmap.com/ - has sectional charts

Ancillary Resources

- https://www.faa.gov/training_testing/testing/supplements/media/sport_rec_private_akts.pdf - Airman Knowledge Testing Supplement
- https://www.faa.gov/air_traffic/flight_info/aeronav/Digital_Products/dafd/search/ - Chart Supplement search by airport
- https://www.youtube.com/user/pilottrainingsystem - Pilot Training System
    - https://www.youtube.com/watch?v=uhm_SQx2y9M - Drone Pilot Training: Airspace
    - https://www.youtube.com/watch?v=-Cb8Kfbq3BI - Drone Pilot Training: Airport Operations
- https://www.youtube.com/c/ERAUSpecialVFR/videos - Embry Riddle Videos
    - https://www.youtube.com/watch?v=c6ZieuNvjHw - Airspace: Lesson 1
    - https://www.youtube.com/watch?v=V_AgxK9JQVU&t=4s - Airspace: Lesson 2
- https://www.youtube.com/watch?v=CexjT1OdWZ4 - FREE FAA Part 107 Remote Pilot Lesson: Airport Operations, Towered & NonTowered Airports, Traffic
- https://www.youtube.com/watch?v=naZaJnBFIaM - Reading Sectional Charts
- https://www.greenbiz.com/article/worlds-first-airport-flying-cars-and-drones-has-just-landed - Zero Emission Electric Drones
- https://hobbyhenry.com/do-drones-cause-pollution/ - Drones and Pollution

- https://deohs.washington.edu/edge/blog/can-trees-clean-jet-pollution - Drones and Measuring Pollution Particles

Holocaust:

- https://en.newsner.com/news/70-years-holocaust-drone-flies-auschwitz-footage-heartbreaking/
- https://builtin.com/drones-robotics/aerial-drones-map-jewish-cemeteries-preservation-efforts
- https://www.trendcentral.com/drone-aeriasl-heartbreakasds/
- https://www.hebcal.com/holidays/yom-hashoah-2023 (Holocaust Memorial Day 4/17/23)
- https://www.hmd.org.uk/what-is-holocaust-memorial-day/this-years-theme/

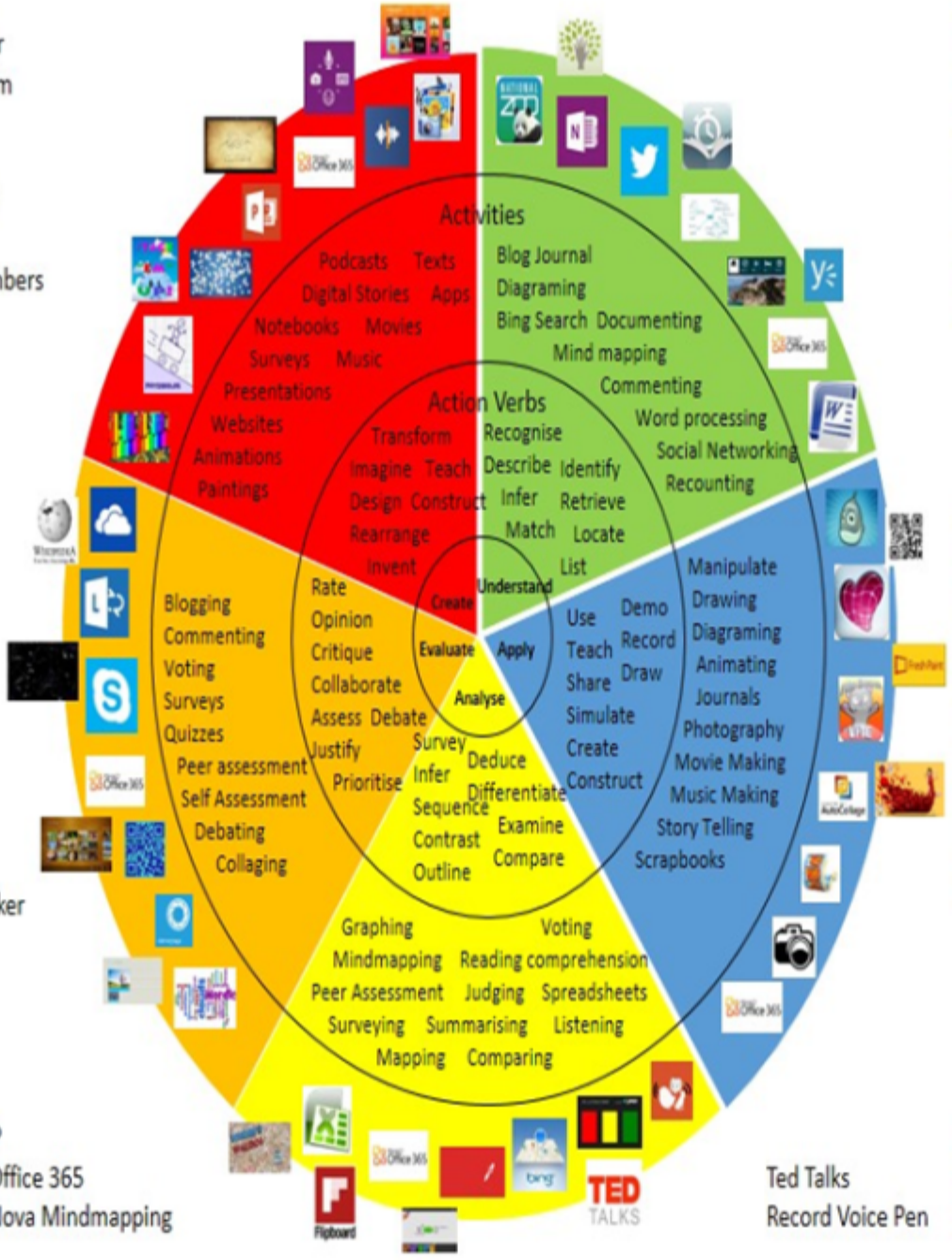
Technology Infusion

- use of the internet - for articles and websites about 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 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;

WRK.9.2.12.CAP.2	Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.
WRK.9.2.12.CAP.6	Identify transferable skills in career choices and design alternative career plans based on those skills.
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.DC.3	Evaluate the social and economic implications of privacy in the context of safety, law, or ethics (e.g., 6.3.12.HistoryCA.1).
TECH.9.4.12.DC.8	Explain how increased network connectivity and computing capabilities of everyday objects allow for innovative technological approaches to climate protection.
TECH.9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8).

21st Century Skills/Interdisciplinary Themes

Exemplars:

- Students will learn to read Chart Supplements and aeronautical charts to learn about airports and the activities taking place nearby them.
- Students will utilize the Airman Supplement legend to confirm information shown in aeronautical charts.

- 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 will read articles and watch short videos to learn how drones are used to better understand the conditions of Auschwitz.
- Students will learn which airspaces would require ATC approval to conduct drone missions.

- 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.
- Make latitude/longitude examples with the axes labeled.
- Have the supplement legend next to each question.

- 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.
- Highlight main ideas in articles, so that information is easier to find.
- Have model charts with labels available to help find latitude and longitude.

- Have the legend next to each question about airspace.

- 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:

- Ask students questions by using the Airman Knowledge Testing Supplement instead of an isolated diagram.
- Do not place the legend next to questions - the supplement has them.
- Have students research emissions that come out of drones.

- 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: Drones and the Holocaust

NJSLS:

Interdisciplinary Connection: History Connection: This activity exposes students to information about the Holocaust and footage of Auschwitz.

Statement of Objective: The student should be able to:

- identify the victims of the Holocaust and what occurred at that time
- determine how drones are being used to help people better understand the Holocaust

Anticipatory Set/Do Now: Brainstorm what students know about the Holocaust.

Learning Activity: Do Now.

Present articles of Holocaust Remembrance Day, videos of drones flying over Auschwitz, drones used to map Jewish cemeteries - they can research in pairs or groups.

Students write their findings as a Performance-Based Assessment, explaining their findings in a video, slideshow or essay.

Students discuss their findings with the class.

Student Assessment/CFU's: observation, questioning

Materials: articles/videos on internet, Chromebooks/computers, Google Classroom

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

Differentiation/Modifications: try to translate articles to Spanish, show students how to display subtitles in their native language, 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-PS4-2	Evaluate questions about the advantages of using a digital transmission and storage of information.
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.
SOC.6.1.12.A.11.e	Assess the responses of the United States and other nations to the violation of human rights that occurred during the Holocaust and other genocides.
TECH.9.4.12.DC.3	Evaluate the social and economic implications of privacy in the context of safety, law, or ethics (e.g., 6.3.12.HistoryCA.1).