Unit 4 - Functions and Broadcasts (Scratch)

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Introduction to Computer Science

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Introduction of Computer Science through Gaming and Design

Unit 4: Functions and Broadcasting, Grades 9-12

Belleville Board of Education

56 Ralph Street

Belleville, NJ 07109

Prepared by: Teacher, Christine Puccio

Unit Overview

- This unit introduces students to the boolean data type.
- The student will be shown the broadcast block so that the code from one sprite can have results on another sprite.
- Functions are made if a given set of code needs to be repeated, or if additional information needs to be passed to them.
- The red "My Blocks" are used to make functions that can take numbers, text, and booleans as arguments.
- Functions and Broadcasts can be called in an animation/game/application.

Enduring Understanding

- The boolean data type has a "true" (1) or "false" value (0).
- The broadcast blocks are used so that the actions of one sprite cause something to happen to another sprite.
- If the user is asked a question, and the response needs to be used in code, it can be passed to a function.
- Functions allow code to be repeated, and they can use the data that is passed to them.
- For example, if a sprite was supposed to do a victory dance, a function could be used for movements of the victory dance.
- If the value of a variable depends on the user's actions, that value can be passed to the function when it is called.
- Once the value is passed, there is a round red block that can be repeatedly used to refer to the value that is passed.
- Both functions and broadcasts can be called in code.

Essential Questions

- How is a boolean value different from the other data types?
- In what part of a game should I use a broadcast block?
- How does a function differ from a broadcast?
- When data is used and the result occurs to the same sprite, why is it more convenient to use a function than a broadcast?
- How can I use a broadcast to make a sprite yell "Score!" when a different sprite scores a point?

Exit Skills

At the end of Unit 4, the student should be able to:

- Determine if a value is an integer, float, string, or boolean.
- Create a broadcast block with code that would affect another sprite.
- Use a broadcast block in a program when the actions of one sprite affect another one.
- Write a function that accepts a passed argument.
- Place function calls and broadcasts into a sprite's script.

New Jersey Student Learning Standards (NJSLS-S)

CS.9-12.8.1.12.AP.1	Design algorithms to solve computational problems using a combination of original and existing algorithms.
CS.9-12.8.1.12.AP.4	Design and iteratively develop computational artifacts for practical intent, personal expression, or to address a societal issue.
CS.9-12.8.1.12.AP.5	Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
CS.9-12.8.1.12.CS.4	Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.
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.

CS.9-12.8.2.12.EC.3	Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience.
CS.9-12.8.2.12.ED.1	Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.
CS.9-12.8.2.12.ED.4	Design a product or system that addresses a global problem and document decisions made based on research, constraints, trade-offs, and aesthetic and ethical considerations and share this information with an appropriate audience.

Interdisciplinary Connections

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.
MA.N-Q.A	Reason quantitatively and use units to solve problems.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
LA.W.11-12.6	Use technology, including the Internet, to produce, share, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
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.
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-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on climate change and other natural 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.
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.
SOC.6.1.12.D.11.d	Compare the varying perspectives of victims, survivors, bystanders, rescuers, and perpetrators during the Holocaust.
SOC.6.2.12.D.6.a	Assess the role of increased personal and business electronic communications in creating a “global” culture, and evaluate the impact on traditional cultures and values.

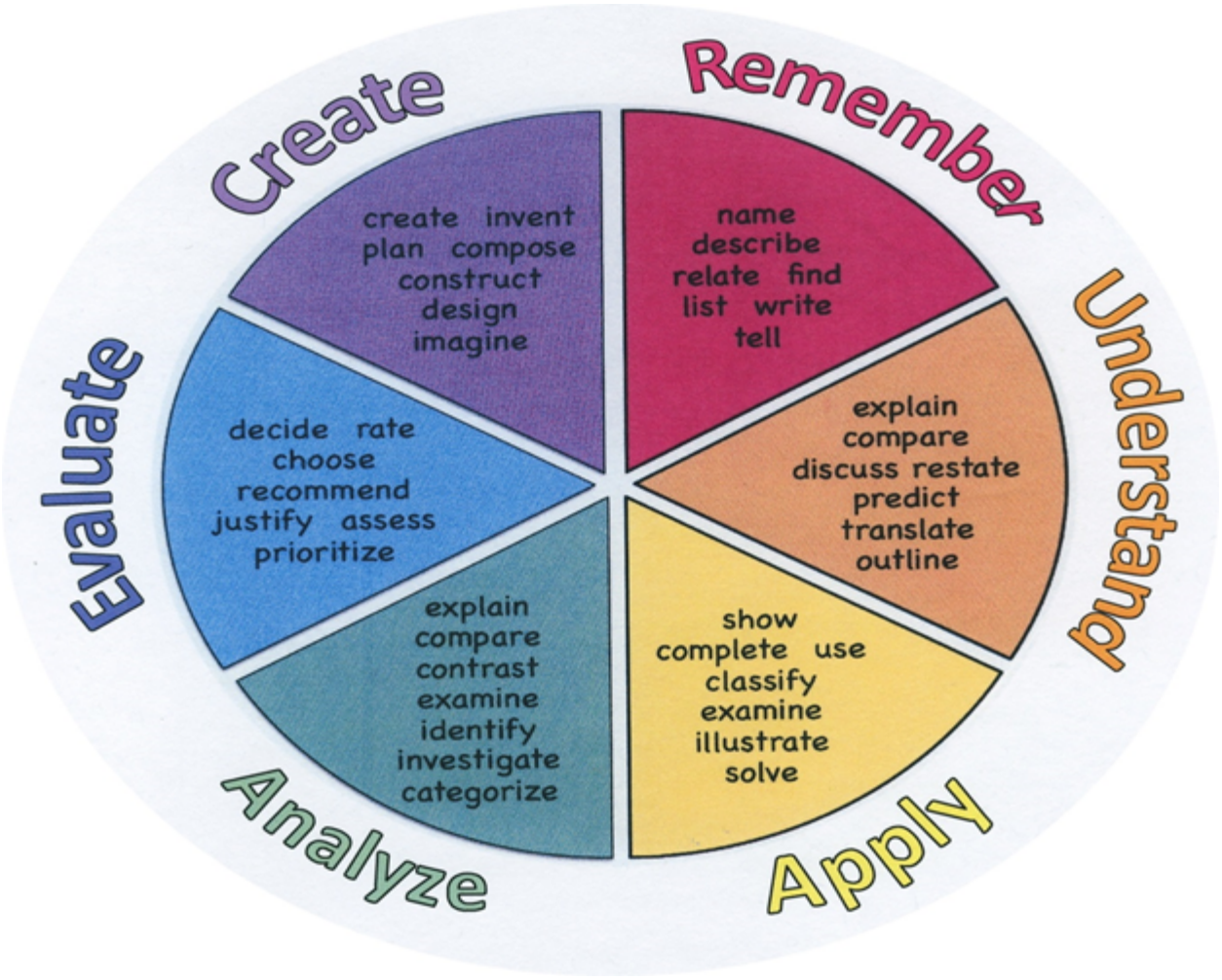
Learning Objectives

- Design an interactive application/game/animation where a broadcast is necessary.
- Develop a function that needs to be called repeatedly in an application/game/animation.

- Judge where broadcast/functions need to be placed in an application/game/animation.
- Determine whether a block of code should be placed in a broadcast or a function.
- Create an animation/quiz with broadcasts and/or functions about the Chinese New Year.
- Create an animation/quiz with broadcasts and/or functions about the Holocaust.
- Create an animation/quiz where at least 2 sprites are communicating about possible solutions to climate change.

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:

- Short slideshow presentations for content, with questioning built into them.
- Use of multiple-choice questions to check for understanding.
- Repetition and review of concepts.
- Step by step visual instructions to make programs, especially at the beginning.
- Google Classroom and Schoology organized around units of study.

- Immediate feedback for assignments.
- Show model code for students to refer to.
- Provide example output for students to compare their results.

Exemplars:

- Have examples of functions and function calls available for students to use as a model.
- Use questioning activities about lists where students get feedback after submission (Edulastic, Google Forms, quizizz.com).
- Use slideshow notes for instructions to make functions and function calls, with illustrations of the blocks in English and Spanish.
- Have students continue to utilize the previous programming components while working with functions and broadcasting

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):

Review the suggested articles and websites about the Holocaust.
Make a brief slideshow with Scratch where functions are needed to display images or facts.
You may choose any article or video that was not listed in the suggested articles/websites.

- 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
- Common Benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Illustration
- Learning Center Activities
- Multimedia Reports
- Outline
- 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:

- computer or Chromebook
- internet access

Resources:

- scratch.mit.edu
- 25 Scratch 3 Games for Kids
- How to Code: A Step-by-Step Guide to Computer Coding

Ancillary Resources

Scratch Coding

- https://csfirst.withgoogle.com/
- https://inventwithscratch.com/book3/
- https://livebook.manning.com/book/hello-scratch/
- https://www.youtube.com/c/ScratchTeam/videos
- https://www.geeksforgeeks.org/introduction-to-scratch-programming-2/ (articles on Scratch)

Asian Americans (Chinese New Year January 22, 2023):

- https://www.britannica.com/topic/Chinese-New-Year
- https://www.history.com/topics/holidays/chinese-new-year

Holocaust:

- https://nationaltoday.com/international-holocaust-remembrance-day/
- https://www.hmd.org.uk/what-is-holocaust-memorial-day/
- https://encyclopedia.ushmm.org/content/en/article/introduction-to-the-holocaust
- https://encyclopedia.ushmm.org/content/en/gallery/receiving-tattoos-at-auschwitz
- https://www.auschwitz.org/en/history/categories-of-prisoners/jews-in-auschwitz/

Climate Change:

- https://climate.nasa.gov/
- https://www.epa.gov/climate-change
- https://education.nationalgeographic.org/resource/climate-change

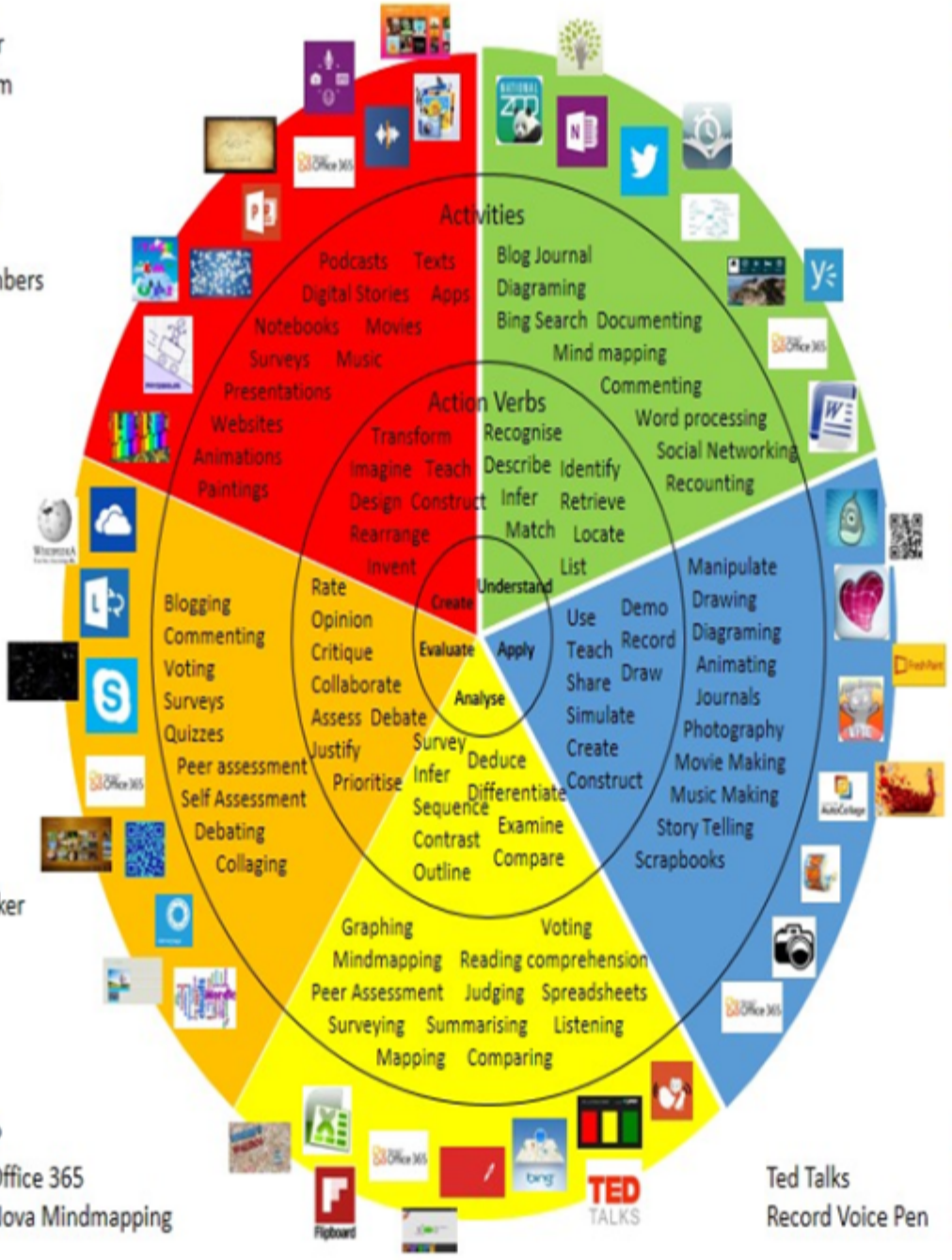
Technology Infusion

- use of the internet - for Scratch and articles about climate change and Chinese New Year.
- 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)
- scratch.com - for programs and games (Formative/Summative)
- 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);
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics;
- World languages;
- Technology;
- Visual and Performing Arts.

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.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
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 learn to break programs into smaller parts when making functions.
- Students will learn to combine their knowledge of functions, lists, and events to create quizzes.

- 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 become more aware of holidays celebrated by other cultures.
- When looking at people's programs for ideas, students use their digital ethics by not copying their code.

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

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
- 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
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Learning contracts

- Leveled rubrics
- Multiple intelligence options
- Multiple texts
- Project-based learning
- Problem-based learning
- Stations/centers
- Tiered activities/assignments
- Tiered products
- Varying organizers for instructions

Lo-Prep Differentiations

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

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

Exemplars:

- Allow multiple-choice assignments, written assignments, and quizzes to be submitted late.
- Convert article to PDF and highlight important ideas for students.
- Give students the opportunity to unscramble computer commands instead of generating their own.

- 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)

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.
- Allow students to use the drop-down menu to choose their native language on software, when applicable.

- 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

Exemplars:

- Minimize the amount of reading that needs to be done.
- Minimize the amount of information that students need to write/type.
- When asking questions, give students possible answers to choose from.
- Give students the opportunity to unscramble commands instead of having to type them.

- 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)

- Have students do further research on climate change, Chinese New Year, and the Holocaust.
- Allow students to use functions for interactive purposes, beyond the classroom assignments.
- Let students see their Scratch program converted to HTML and identify the parts of code.

- 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 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

Sample Lesson

Unit Name: Functions and The Holocaust

NJSLS:

Interdisciplinary Connection: Social Studies Connection - Students learn about the suffering and genocide of the Auschwitz prisoners.

Statement of Objective: The student should be able to:

- Read and gather information from articles and videos about the Holocaust.
- Use their findings to create a Scratch program that uses functions.

Anticipatory Set/Do Now: Ask students if they know what occurred during the Holocaust.

Learning Activity: Do Now.

Present articles and videos about the Holocaust for students to review.

Have whole-class discussion about the students' findings.

Students incorporate their findings into Scratch programs with functions.

Student Assessment/CFU's: observation, questioning

Materials: internet access, computers/Chromebooks, videos/articles about the Holocaust

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

Differentiation/Modifications: provide diagrams of the code blocks for students who are lost, try to translate articles to Spanish, have main ideas highlighted for at-risk/IEP students, peer tutoring

Integration of Technology: use of the internet, use of computers/Chromebooks, use of Scratch software

LA.W.11-12.2.D	Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.
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