Unit 3: Data Types and Lists (Scratch)

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Introduction to Computer Science

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Introduction to Computer Science Through Gaming and Design

Unit 3: Data Types and Lists (Scratch), Grades 9-12

Belleville Board of Education

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Board Approved:

Unit Overview

- This program introduces students to numeric and text data types.
- The students will learn the difference between an integer, a float, and a string.
- Students will learn to use the join block to have an output of two or more pieces of data.
- Lists can be created by using the add block to insert data into it.
- Lists have methods to determine its length, refer to data by its list position and whether to not an item is contained in it.
- It is possible to change a list by inserting items into a specific position, removing items, and placing items at the end of a list.
- List items and method results can be printed and joined.

Enduring Understanding

- Numbers with a decimal point are called "floats", numbers without a decimal point are "integers".
- Strings are a sequence of characters, and they can be joined for output.
- The orange circle blocks represent variables or list items.
- The green join block is used to combine 2 different pieces of data.
- "length" finds the number of items in a list, "item #" finds the position of data in a list, and "contains" determines whether an item appears in the list.
- All of this information can be joined to strings and/or printed to the screen (with the say command).
- The insert block takes 2 arguments, the item and its index (position).

- The add block adds items to the end of a list, and the delete blocks canremove items from a list.
- Lists can be hidden or shown in a program.

Essential Questions

- How can someone determine what data type an item is?
- Can a list's information be used in a program?
- Why is there no space between the list information and the strings?
- Is it possible to use more than one join block if there are more than 2 items to join?
- How do I know when to use "item ___ in list" or "item # of ____ in list"?
- How can a list be used in a game?

Exit Skills

At the end of Unit 3, the student should be able to:

- Determine the data type of an item.
- Use the add block to make a list
- Use the delete and insert blocks to alter a list.
- Use the join block to place list information next to strings with the correct amount of spacing in between.
- Know when to use the "length", "item ____ in list", and "item # of _____ in list" to display data about lists.
- Use the say method to print lists and the hide method so that a list will not appear in the output.

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-ESS2-4	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
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.16.a	Examine the impact of media and technology on political and social issues in a global society.

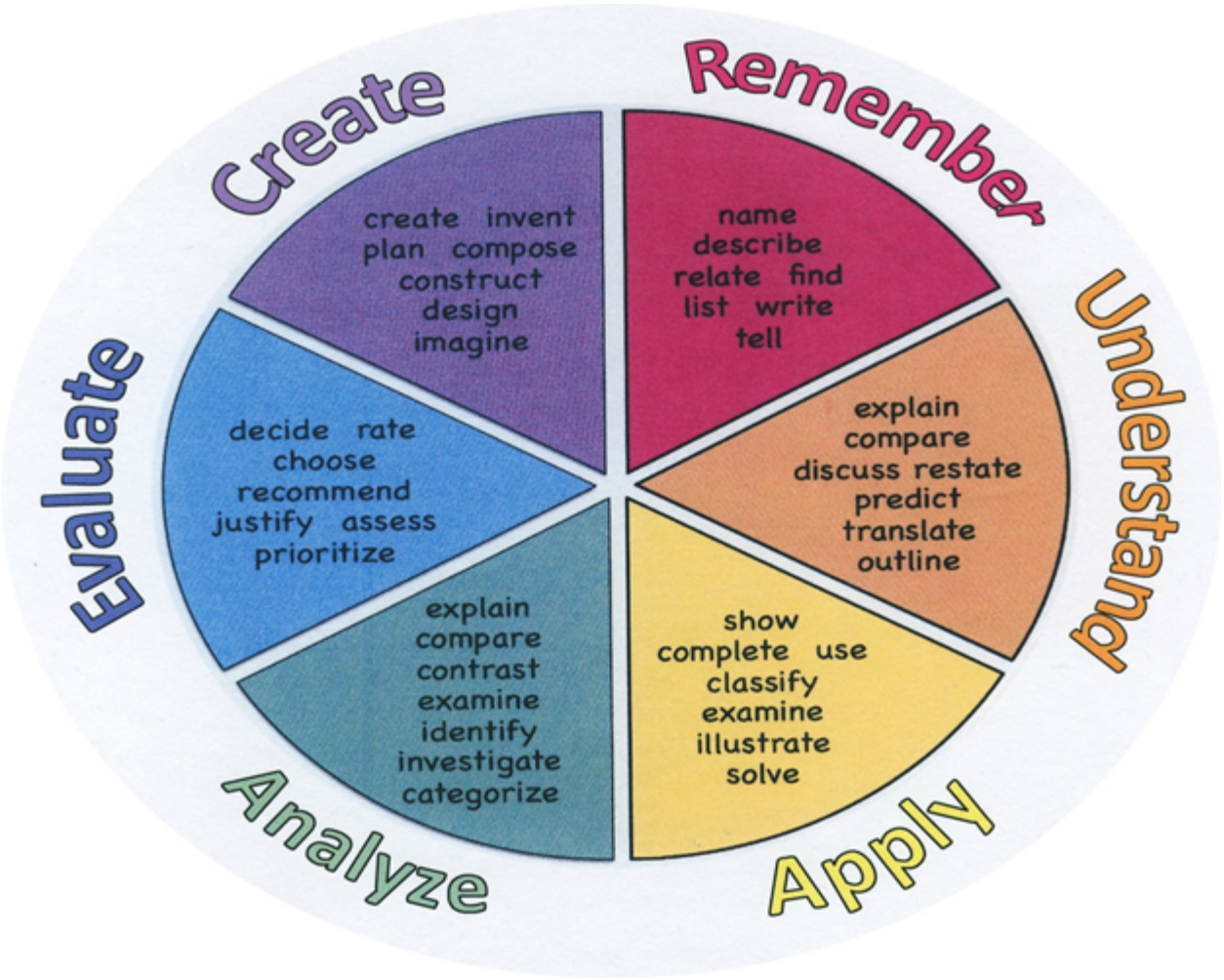
Learning Objectives

- Distinguish between data types.
- Make a list of information with the add block.
- Alter lists with the insert and delete blocks.
- Combine a phrase with list information so that the proper spacing is shown in the output.
- Develop output that states the length of a list, the location of an item in the list, and whether or not an item is in the list.
- Generate a list of facts about the origin and celebration of Kwanzaa.

- Make a list of the possible reasons for 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.
- Programming with blocks (where students can translate to native language).
- Google Classroom and Schoology organized around units of study.
- Immediate feedback for assignments.
- Provide example output for students to compare their results.

Exemplars:

- Use questioning activities about lists where students get feedback after submission (Edulastic, Google Forms, quizizz.com).
- Use slideshow notes for instructions to make programs, with illustrations of the blocks in English and Spanish.
- Have students continue to utilize the visual components of programming while working with lists.

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 Kwanzaa, an important African American celebration.
Make a brief slideshow with Scratch where the facts are displayed in a list.
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)

African Americans:

- https://www.officialkwanzaawebsite.org/ (making lists in Scratch)

Climate Change:

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

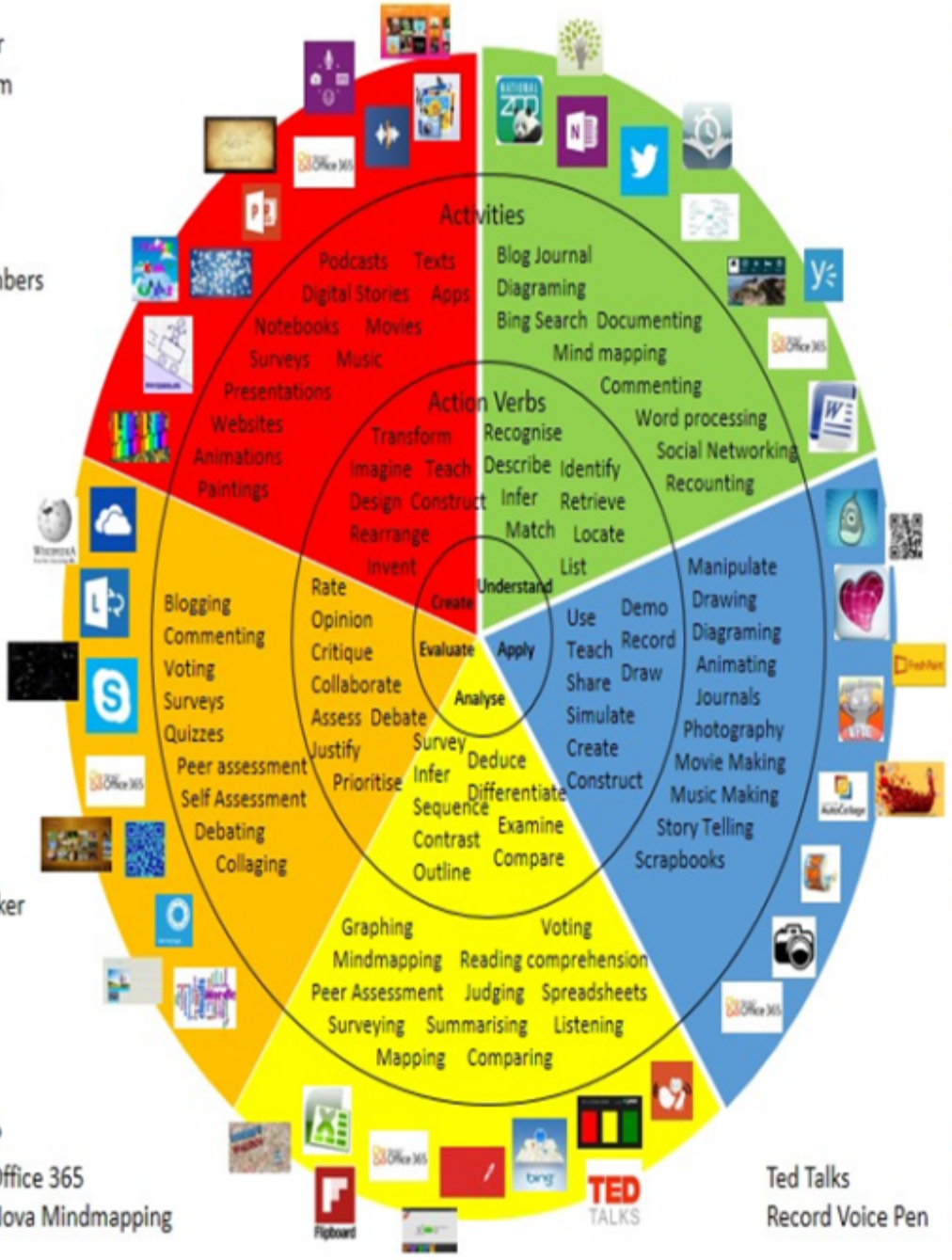
Technology Infusion

- use of the internet - for Scratch and articles about climate change and Kwanzaa
- 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;
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics;
- World languages;
- 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.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
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 save space and time by storing data in lists instead of multiple variables.
- Students read articles about Kwanzaa and climate change and store the facts in lists.

- 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 learn about Kwanzaa, an African American annual celebration.
- Students find more efficient ways to store data (variables vs lists).

- 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 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
- 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 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
- 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)

Exemplars:

- Have students do further research on climate change and Kwanzaa.
- Allow students to make Scratch quizzes that require lists.
- 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: Kwanzaa and Lists

NJSLS:

Interdisciplinary Connection: Social Studies Connection - Students learn about holidays that other religions and countries celebrate.

Statement of Objective: The student should be able to:

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

Anticipatory Set/Do Now: Ask students what they know about Kwanzaa.

Learning Activity:

Do Now

Present articles and videos about Kwanzaa for students to review.

Students discuss their findings with the class.

Students create a Scratch program with a list that contains the facts.

Student Assessment/CFU's: observation, questioning

Materials: internet access, computers/Chromebooks, videos/articles about Kwanzaa

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

Differentiation/Modifications: 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

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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.
TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).