Unit 4 Computational Thinking: Coding

Content Area: **Technology**
Course(s): **Computer Applications 2 Gr. 8**
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Title Section

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Computer Applications 2, 8th Grade

Unit 4 Computational Thinking: Coding

Belleville Board of Education

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Unit Overview

Unit 4, Computational Thinking, 60 sessions, takes a wide spectrum on computer science by covering topics such as programming, physical computing, web development, design, and data. In this unit students will be inspired as they build their own websites, apps, games, and physical computing devices.

The first unit, Problem Solving, is a highly interactive and collaborative introduction to the field of computer science, as framed within the broader pursuit of solving problems. Through a series of puzzles, challenges, and real world scenarios, students are introduced to a problem solving process that they will return to repeatedly throughout the course. Students then learn how computers input, output, store, and process information to help humans solve problems. The unit concludes with students designing an application that helps solve a problem of their choosing.

Enduring Understanding

Every 21st century student should have the opportunity to learn computer science. The basics of computer science help nurture creativity and problem-solving skills, preparing students for a future in any field or career.

Essential Questions

- What strategies and processes can I use to become a more effective problem solver?
- How can text communicate content and structure on a web page?
- Why do people create websites?

- How can I incorporate content I find online into my own webpage?
- What strategies can I use when coding to find and fix issues?
- How do I modify the appearance and style of my web pages?
- How do I safely and appropriately make use of the content published on the internet?
- What is a computer program?
- What are the core features of most programming languages?
- How does programming enable creativity and expression?
- Which practices and strategies will help me as I write programs?
- How do software developers manage complexity and scale?
- How can programs be organized so that common problems only need to be solved once?
- How can I build on previous solutions to create even more complex behavior?

Exit Skills

By the end of Grade 8, Computer Applications 2 Unit 4, Computational Thinking:Coding, Students will be able to:

- identify the defining characteristics of a computer and how it is used to solve information problems.
- use a structured problem solving process to address problems and design solutions that use computing technology.
- build a collaborative classroom environment where students view computer science as relevant, fun, and empowering.
- create a digital artifact that uses multiple computer languages to control the structure and style of their content
- view computer science as a tool for personal expression.
- understand that different languages allow them to solve different problems, and that these solutions can be generalized across similar problems.
- understand their role and responsibilities as both creators and consumers of digital media.
- create an interactive animation or game that includes basic programming concepts such as control structures, variables, user input, and randomness.
- manage this task by working with others to break it down using objects (sprites) and functions.
- they should give and respond constructively to peer feedback and work with their teammates to complete a project.
- leave this unit viewing themselves as computer programmers, and see programming as a fun and creative form of expression.

New Jersey Student Learning Standards (NJSLS-S)

TECH.8.1.8	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.8.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.8.A.1	Demonstrate knowledge of a real world problem using digital tools.
TECH.8.1.8.A.CS1	Understand and use technology systems.
TECH.8.1.8.A.CS2	Select and use applications effectively and productively.

TECH.8.1.8.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.8.B.CS2	Create original works as a means of personal or group expression.
TECH.8.1.8.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.1.8.C.CS1	Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media.
TECH.8.1.8.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
TECH.8.1.8.C.CS4	Contribute to project teams to produce original works or solve problems.
TECH.8.1.8.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
TECH.8.1.8.E.CS1	Plan strategies to guide inquiry.
TECH.8.1.8.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
TECH.8.1.8.F.CS1	Identify and define authentic problems and significant questions for investigation.
TECH.8.1.8.F.CS2	Plan and manage activities to develop a solution or complete a project.
TECH.8.2.8	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.8.A	The Nature of Technology: Creativity and Innovation: Technology systems impact every aspect of the world in which we live.
TECH.8.2.8.A.2	Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system.
TECH.8.2.8.A.CS1	The characteristics and scope of technology.
TECH.8.2.8.A.CS2	The core concepts of technology.
TECH.8.2.8.A.CS3	The relationships among technologies and the connections between technology and other fields of study.
TECH.8.2.8.B	Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.
TECH.8.2.8.B.2	Identify the desired and undesired consequences from the use of a product or system.
TECH.8.2.8.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.8.C.1	Explain how different teams/groups can contribute to the overall design of a product.
TECH.8.2.8.C.CS1	The attributes of design.
TECH.8.2.8.E	Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.
TECH.8.2.8.E.1	Identify ways computers are used that have had an impact across the range of human activity and within different careers where they are used.
TECH.8.2.8.E.2	Demonstrate an understanding of the relationship between hardware and software.
TECH.8.2.8.E.3	Develop an algorithm to solve an assigned problem using a specified set of commands and use peer review to critique the solution.

TECH.8.2.8.E.4	Use appropriate terms in conversation (e.g., programming, language, data, RAM, ROM, Boolean logic terms).
TECH.8.2.8.E.CS1	Computational thinking and computer programming as tools used in design and engineering.

Interdisciplinary Connections

6-8.MS-ESS1-2.4.1	Models can be used to represent systems and their interactions.
6-8.MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
6-8.MS-ETS1-3.4.1	Analyze and interpret data to determine similarities and differences in findings.

Learning Objectives

Students will be able to:

- identify the defining characteristics of a computer and how it is used to solve information problems.
- use a structured problem solving process to address problems and design solutions that use computing technology.
- build a collaborative classroom environment where students view computer science as relevant, fun, and empowering.
- create a digital artifact that uses multiple computer languages to control the structure and style of their content
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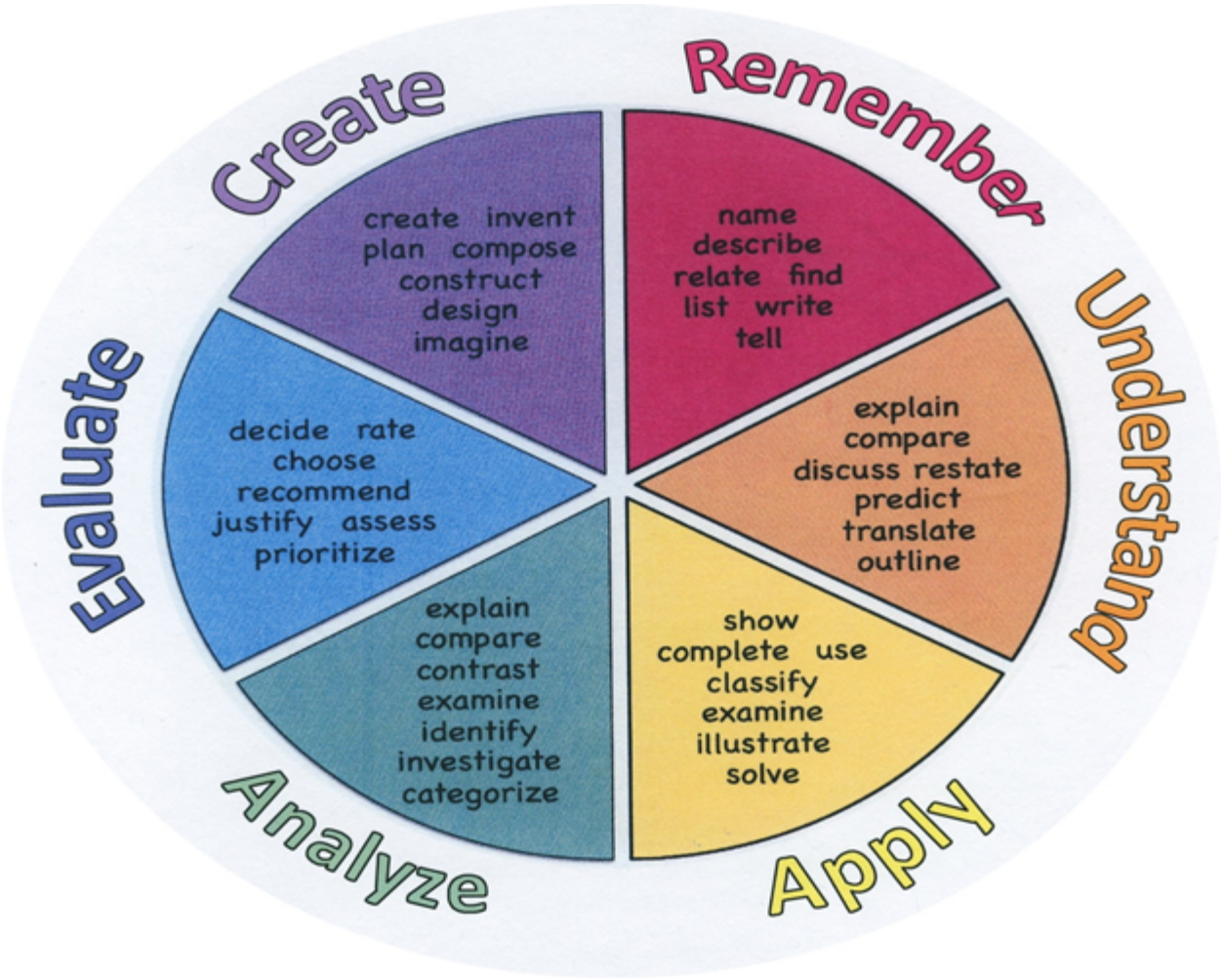
- manage this task by working with others to break it down using objects (sprites) and functions.
- they should give and respond constructively to peer feedback and work with their teammates to complete a project.
- leave this unit viewing themselves as computer programmers, and see programming as a fun and creative form of expression.

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

Activities will allow students to improve their critical thinking skills

Code.Org

- Computer Science Discoveries 19-20

https://curriculum.code.org/csd-19/

Everfi

- Radius

https://platform.everfi.net/

Assessment Evidence - Checking for Understanding (CFU)

Web-Based Assessments-Students will complete a web based assessment for each course in Code.org (summative assessment)

Discuss the steps of coding that will allow one to create a new game (formative assessment)

Write a step-by-step guide to "bigginner's coding" utilizing descriptions and graphics of choice (can be a paper brochure or a web-based product) (alternative assessment)

- Admit Tickets
- Anticipation Guide
- Common Benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- DBQ's
- Define
- Describe
- Evaluate
- Evaluation Rubrics
- Exit Tickets
- Explaining
- Fist-to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Charts
- Learning Center Activities
- Multimedia Reports
- Newspaper Headline
- Outline
- Question Stems
- Quickwrite
- Quizzes

- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Surveys
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit Review/Test Prep
- Unit tests
- Web-Based Assessments
- Written Reports

Primary Resources & Materials

Code.Org

- Computer Science Discoveries 19-20

https://curriculum.code.org/csd-19/

Ancillary Resources

Everfi Radius will complment Code.org activitiesi

Everfi

- Radius

https://platform.everfi.net/

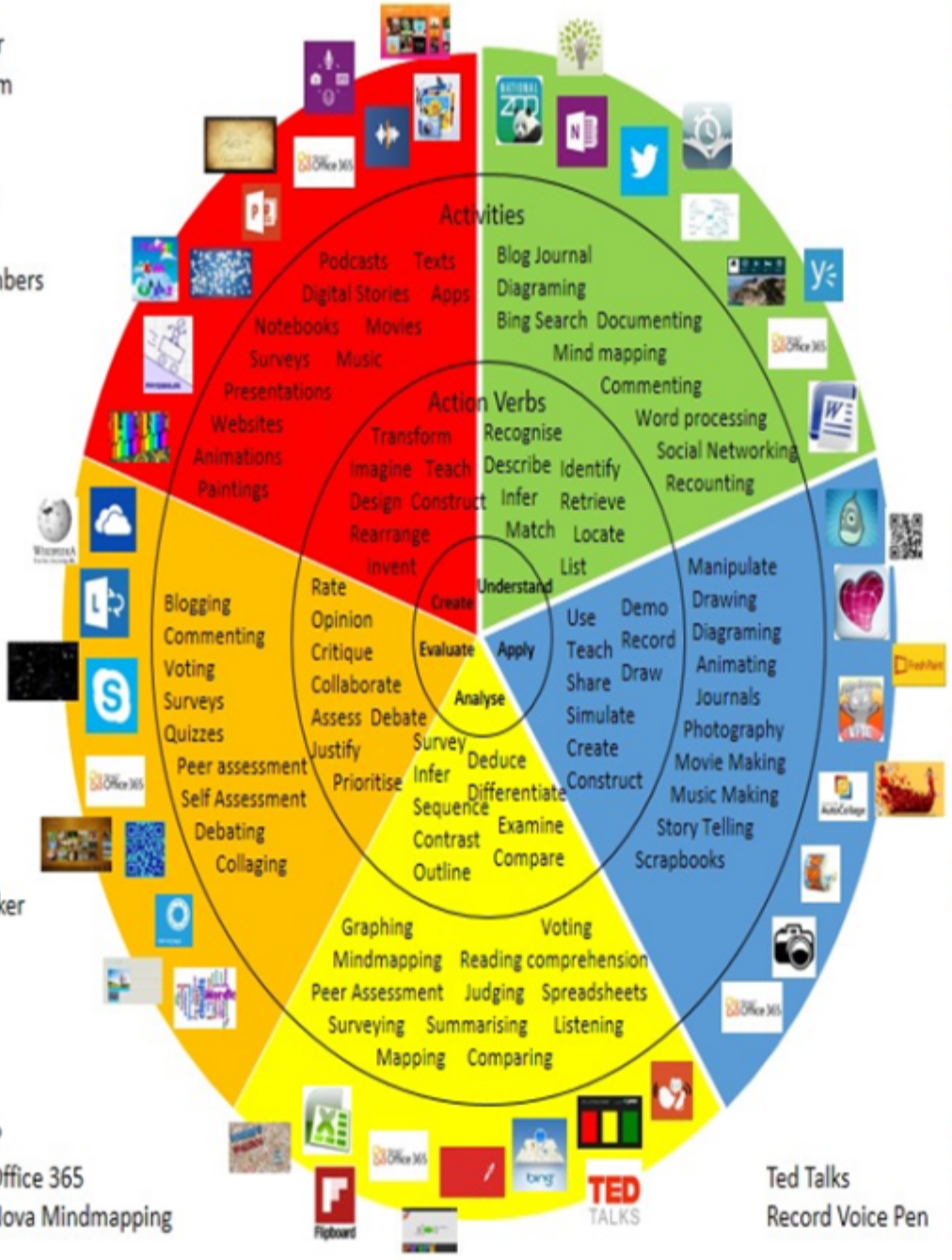
Technology Infusion

- Code.org
- Everfi

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);
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics;
- World languages;
- Technology;
- Visual and Performing Arts.

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP11	Use technology to enhance productivity.
CAEP.9.2.8.B.2	Develop a Personalized Student Learning Plan with the assistance of an adult mentor that includes information about career areas of interest, goals and an educational plan.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
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TECH.8.1.8.A.CS2	Select and use applications effectively and productively.
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TECH.8.1.8.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
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TECH.8.2.8.B.2	Identify the desired and undesired consequences from the use of a product or system.
TECH.8.2.8.B.CS2	The effects of technology on the environment.
TECH.8.2.8.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.8.C.1	Explain how different teams/groups can contribute to the overall design of a product.
TECH.8.2.8.C.CS1	The attributes of design.
TECH.8.2.8.C.CS2	The application of engineering design.
TECH.8.2.8.E	Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.
TECH.8.2.8.E.1	Identify ways computers are used that have had an impact across the range of human activity and within different careers where they are used.
TECH.8.2.8.E.3	Develop an algorithm to solve an assigned problem using a specified set of commands and use peer review to critique the solution.
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21st Century Skills/Interdisciplinary Themes

- 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

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

Please list only the **21st Century Skills** that will be incorporated into this unit.

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

Differentiation

Differentiations:

Exemplar:

- Student(s) work with assigned partner-students will be assigned a partner and work with them in school to complete assignments

    - Small group instruction
    - Small group assignments
    - Extra time to complete assignments
    - Pairing oral instruction with visuals
    - Repeat directions
    - Use manipulatives
    - Center-based instruction
    - Token Economy
    - Study Guides
    - Teacher reads assessments aloud
    - Sheduled breaks
    - Rephrase written directions
    - Multisensory approaches

- Additional time
- Preview vocabulary
- Preview content and concepts
- Story Guides
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Assistive Technology
- Auditory presentations
- Large Print edition
- Dictation to scribe
- Small group setting

Hi-Prep Differentiations:

Exemplar:

- Choice boards: Students will be given 2 teacher choices and can develop a choice of their own

    - Alternative formative and summative assessments
    - Choice boards
    - Games and tournaments
    - Group investigations
    - Guided reading
    - Independent research and projects
    - Interest groups
    - Learning Contracts
    - Leveled rubrics
    - Literature Circle
    - Multiple intelligence options
    - Multiple Texts
    - Personal agendas
    - Project-based learning
    - Problem-based learning
    - Stations/Centers
    - Think-Tac-Toe
    - Tiered activities/assignments
    - Tiered products
    - Varying organizers for instructions

Lo-Prep Differentiations

Exemplar:

- Mini workshops to re-teach or extend skills -Workshops will be given weekly on objectives not mastered

    - Choice of books or activities
    - Cubing activities
    - Exploration by interest
    - Flexible grouping
    - Goal setting with students
    - Jigsaw
    - Mini workshops to re-teach or extend skills

- Open-ended activities
- Think-pair-share
- Reading buddies
- Varied journal prompts
- Varied Supplemental Materials

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

Exemplar:

Teacher initiated weekly assignment sheet. Assignment sheet will be on Google Classroom with assignmets and due dates

- 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
- multiple test sessions
- multi-sensory presentation
- preferential seating
- Preview of Content, concepts, and vocabulary
- printed copy of board work/notes provided
- 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)

Exemplar:

Allowing the use of note cards or open-book during tests. Students will be allowed to make note cards on steps to complete learned tasks and use them on tests along with student note books

- 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 test
- 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
- teaching key aspects of a topic. Eliminate nonessential information
- 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

Exemplar:

Allowing the use of note cards or open-book during tests. Students will be allowed to make note cards on steps to complete learned tasks and use them on tests along with student note books

- allowing students to correct errors (looking for understanding)
- 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 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 teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- modifying tests to select from given choices
- providing study guide
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- teaching key aspects of a topic. Eliminate nonessential information
- 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)

Exemplar:

Allow students to work at a faster pace. Students will be allowed to work at their own pace and complete enrichment activities such as making their own game.

- 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 blog or social media page about their unit
- 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
- 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: Computational Thinking: Coding

NJSLS: See Attached

Interdisciplinary Connection: With the 1:1 initiative in place, this unit will connect to all classes.

Statement of Objective: SWBAT

- Communicate and collaborate with classmates in order to solve a problem
- Iteratively improve a solution to a problem
- Identify different strategies used to solve a problem

Learning Activity: Code.org CS Discoveries: Build an Aluminum Boat, add pennies,see how many pennies you can place on boat until it sinks.

21st Century Themes and Skills: See Attached

Differentiation: Small Group Instruction, peer assistance.

Integration of Technology: Use of computers in class.

https://curriculum.code.org/csd-19/unit1/1/

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