

Unit 2 : Costumes, Variables, Conditionals, and Loops

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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 2 - Costumes, Variables, Conditionals, and Loops (Scratch), Grades 9-12

Belleville Board of Education

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Board Approved:

Unit Overview

- This unit introduces students to backdrops and costumes, which can be used to change the appearance of a program.
- Students will also see how variables are used to set and store values in a program.
- They will use the ask method to ask users questions and store their responses in a variable.
- Conditional statements are used to affect the output and sequence of a program.
- Loops can be used to repeat commands a specific number of times or until a condition is met.

Enduring Understanding

- A backdrop is the background of a game, application, or animation.
- A costume is another image of the same sprite.
- It can be used to make slideshows of information or change the appearance of a sprite (color, size, movement of body parts, etc.).
- A variable represents a value that can be changed. For example, it is used in a game to keep track of score and time.

- The ask and wait method is used to collect data from the user, and the most recent response is stored in a variable called "answer".
- Conditional statements use if-then or if-then-else, and the truth of the condition affects the output and sequence of a program.
- There are repeat, repeat until, wait until, and forever loops that repeat a set of instructions, where costumes are changed, sprites move, input is collected, etc.
- Loops can be finite (eventually end) or infinite (never end).
- Games or parts of games are often placed in a forever loop (an infinite loop).
- Sometimes conditionals and loops can be nested (one inside the other).
- A nested conditional is used when more than one path of action is possible.
- An example of a nested loop is when the color of a shape changes (outer loop) each time a shape is drawn (inner loop).

Essential Questions

- Does it matter if I use backdrops or sprites to display information in a slideshow?
- What variables can be used in different types of games/animations/applications?
- How can a sprite be made to appear as if it is walking, exploding, etc.?
- How can we collect multiple pieces of information, since "answer" only stores the most recent response?
- What will determine whether a finite or an infinite loop should be used in a program?
- How can we use sprites and backdrops that are not included in Scratch?

Exit Skills

After completing Unit 2, the student should be able to:

- Use Scratch blocks to change backdrops or costumes.
- Create and use variables to store information.
- Use the ask method to collect information from a user.
- Determine the output of a program with a given conditional.
- Determine which type of loop needs to be used in a given program.
- Use loops to change costumes and move sprites.
- Determine which commands get repeated in a given loop.
- Recognize nested conditionals and loops, and predict their output.
- Construct a nested conditional or nested loop in a program.

New Jersey Student Learning Standards (NJSLS)

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.11-12.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
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.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-ESS3-4	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.6.2.12.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.

SOC.6.3.12.CS1

Determine the credibility and value of information, while also considering context, point of view, and multiple perspectives.

Learning Objectives

- Design animations/games/applications where the backdrop or costume changes.
- Assess what types of variables are needed in a program and use them for the correct purpose.
- Develop an animation/game/application where input is collected from the user and the response is used in the program.
- Compare the different types of loops and determine when each one should be used.
- Judge the course of action that appears in a program with loops and conditionals that are simple or nested.
- Generate simple or nested loops/conditionals in a program when they are needed.
- Use sprite costumes to generate a slideshow about climate change, LGBTQ, or Diwali (an Indian celebration).

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 variables, conditionals, and loops 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 identify motion, backdrops, and events while they are working on current content.

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 Diwali, an important Indian celebration.

Make a brief slideshow with Scratch where each sprite costume contains an image and/or a fact.

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
- Anticipation Guide
- 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

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)

Climate Change:

- <https://scratch.mit.edu/projects/402769683> (slideshow ideas)
- <https://climate.nasa.gov/>
- <https://www.epa.gov/climate-change>
- <https://education.nationalgeographic.org/resource/climate-change>

LGBTQ

- <https://scratch.mit.edu/projects/447896662/> (conditionals with color)
- <https://scratch.mit.edu/studios/5842709/> (slideshow ideas)
- <https://scratch.mit.edu/studios/4995459> (slideshow ideas)

Diwali (Important Indian holiday):

- <http://kids.nationalgeographic.com/pages/article/diwali>
- <https://www.youtube.com/watch?v=mPwmXRws7FA> (India's Festival of Lights)
- <https://www.nbcchicago.com/news/local/what-is-diwali-what-to-know-about-the-festival-of-lights/2671348/>

Technology Infusion

- use of the internet - for Scratch and articles about climate change and Diwali
- 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)

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 present information clearly in their Diwali costumes.
 - Students communicate and share ideas about Diwali and climate change.
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- Communication and Collaboration
 - Creativity and Innovation
 - Critical thinking and Problem Solving
 - ICT (Information, Communications and Technology) Literacy

- Information Literacy
- Life and Career Skills
- Media Literacy

21st Century Skills

Exemplars:

- Students read and interpret articles/videos about climate change and Diwali.
- Students learn about holidays celebrated outside of the United States.

- 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
- Interest groups
- 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.
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- 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 Diwali.

- Allow students to explore Scratch beyond the class content.
- 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 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 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: Diwali (an important Indian holiday) and Scratch

NJSLS:

Interdisciplinary Connection: Social Studies Connection: Students are finding out about what holidays are important to people from other countries.

Statement of Objective: The student should be able to:

- Explain what Diwali is.
- Create a Scratch program with facts and illustrations about Diwali through the use of sprite costumes.

Anticipatory Set/Do Now: Discuss holidays that are not shown on the school calendar.

Learning Activity:

- Do Now.
- Present articles and videos about Diwali for students to review individually or in groups.
- Students discuss their findings and create a Scratch program with their information.

Student Assessment/CFU's: observation, questioning

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

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

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

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

LA.W.11-12.3.D	Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters.
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.
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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.IML.7	Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change (e.g., NJLSA.W1, 7.1.AL.PRSNT.4).