

Unit 8: Interactive Python Games with P5

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Introduction to Computer Science

Department of Curriculum and Instruction



Belleville Public Schools

Curriculum Guide

Intro to Computer Science through Gaming and Design, Grades 9-12

Unit 8: Interactive Python Games with P5

Belleville Board of Education

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Unit Overview

- In this unit, students will add lines of p5 code to make a program interactive and dynamic.
- p5 is a Python module that usually needs to be installed on a computer, but it can be used if a p5 compatibility file is used along with the code.
- The students will write lines of code to add shapes, create obstacles, add motion, and detect collisions.

Enduring Understanding

- The Raspberry Pi Foundation has a section where p5 compatibility files are used to allow Python p5 functions to be used without installing anything.
- There are functions like `load_image` and `ellipse` that place images/shapes onto the screen without a lot of extra code.
- These p5 functions can be integrated with Python code without any modifications, except an import statement.
- Some of the code will already be written, and the student must add additional lines step by step.
- The more advanced animations/games require additional text and/or python files to be used.

Essential Questions

- How can the p5 functions be used without installing the module?
- Will all of the p5 functions work along with the p5 compatibility files?
- What can be done with the p5 module?
- Will this activity only work through the <https://projects.raspberrypi.org/> website, or is there a way to make it work without it?

Exit Skills

At the end of Unit 8, the student should be able to:

- Follow directions to insert lines of Python code to create a dynamic program.
- Use the correct syntax when typing Python code.
- Debug a program when the line with the syntax error is given.
- Determine which part of the program is responsible for each action.
- Identify different parts of a program, like variables, functions, arguments, loops, and conditionals.

New Jersey Student Learning Standards (NJSL-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.11-12.2.D	Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.
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-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.

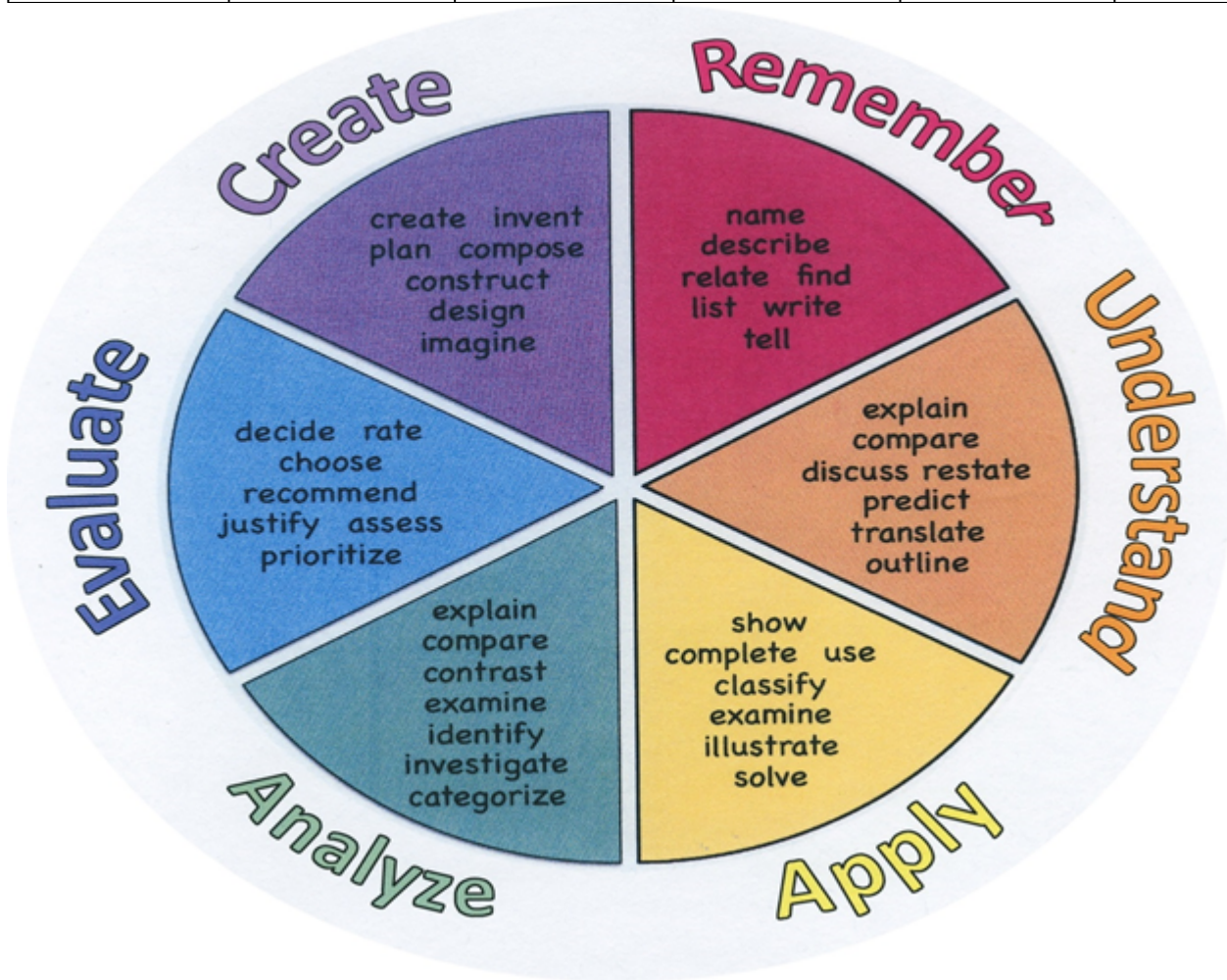
Learning Objectives

- Produce an interactive, dynamic Python program by adding lines of code.
- Determine the bug in a Python program, given the line number and similar code around it.
- Point out the parts in a Python program, like variables, functions, arguments, loops, and conditionals.
- Revise a game or animation to the color, shapes, speed, images, etc. to your preferences.
- Revise the rocket launch animation to create an one of the air pollution, causing 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			Reconstruct
	Translate	Examine			Revise
	Associate	Graph			Rewrite
	Compute	Interpolate			Transform
	Convert	Manipulate			
	Discuss	Modify			
	Estimate	Operate			
	Extrapolate	Subtract			
	Generalize				
	Predict				



Suggested Activities & Best Practices

Best Practices:

- Encourage students to test their code and find the bugs.
- Have students code in an environment where they can see the code and output at the same time.
- Incorporate previous content into the programs in this unit.
- Immediate feedback for assignments.
- Step by step visual instructions to make programs with functions.
- Show model code for students to refer to.
- Provide example output for students to compare their results.
- Google Classroom and Schoology organized around units of study.
- Short slideshow presentations for content, with questioning built into them.

Exemplars:

- Have examples of Python code available for students to use as a model.
- Use questioning activities about Python games where students get feedback after submission (Edulastic, Google Forms, quizizz.com).
- Use slideshow notes for instructions to use Python, with each new code block on a slide.
- Have students continue to use conditional, loops, variables, functions, etc. in their games.

Evidence of Student Learning - 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)
- Coding Rooms - for practice programs and projects (Formative)
- trinket.io/python - for game-based programming with p5 methods and functions (Formative/Summative)

Performance Task Example (Alternate):

Go through websites on LGBTQ pride.

Make a brief program/game/animation (ex: quiz) with the facts that were found.

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
- Journals
- Outline
- Quizzes
- Self- assessments
- Study Guide
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Unit tests

Primary Resources & Materials

- Creative Coding in Python
- Coding for Kids Python
- Coding Games in Python
- <https://projects.raspberrypi.org/en/codeclub>
- <https://trinket.io/python>

Ancillary Resources

LGBTQ:

- <https://www.loc.gov/lgbt-pride-month/about/> (Library of Congress)
- <https://lgbtq.wfu.edu/resources/lgbtq-terminology/>

- <https://www.cnn.com/2022/06/01/health/pride-month-explainer/index.html>

Coding:

- <https://www.codingrooms.com/>
- <https://realpython.com/beginners-guide-python-turtle/>
- <https://blockly.games/>
- <https://www.youtube.com/c/TechWithTim/search?query=turtle> (Tech with Tim Python Turtle Graphics Tutorials)
- <https://hourofcode.com/us/learn>
- <https://studio.code.org/s/csd3-2021> (Interactive Animations - Javascript)

Technology Infusion

- use of the internet - for Python websites and articles about LGBTQ pride month
- edulastic.com - for practice exercises and assessment (Formative/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/Summative)
- 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)
- code.org - for Hour of Code activities (Formative)
- trinket.io/python - for programs (Formative)
- <https://www.codingrooms.com/> (Formative)
- oncourse.com - for benchmarks (if applicable) (Summative/Benchmark)

Alignment to 21st Century Skills & Technology

- English Language Arts;
- Mathematics;
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics;
- 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.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).

21st Century Skills/Interdisciplinary Themes

Exemplars:

- The student will add lines of code to an already existing program.
- The student will learn to make a game requiring 2 files.

- 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

- The student will learn about LGBTQ Pride Month.

- The student will learn about the fields where coding applications are used.

- 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
- Personal agendas
- 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 (IEP's & 504's)

Exemplars:

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

- 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

English Language Learners (ELL)

Exemplars:

- Have all notes, activity directions, and assessment items translated into Spanish.
 - Place students next to Spanish-speaking peers.
 - Make visual instructions.
 - 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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- 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 length
 - multi-sensory presentation
 - multiple test sessions
 - preferential seating
 - preview of content, concepts, and vocabulary
 - 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

At Risk

Exemplars:

- Minimize the amount of reading that needs to be done.

- Minimize the amount of information that students need to write/type.
- Make step-by-step instructions when adding line of codes to a program.
- When asking questions, give students possible answers to choose from.
- Give students the opportunity to unscramble commands instead of having to generate them by themselves.

- 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

Sample Lesson

Unit Name: LGBTQ Pride and Writing Code

NJSLS:

Interdisciplinary Connection: Social Studies Connection: The students will learn about the origin of LGBTQ Pride.

Statement of Objective: The student should be able to:

- Know the origin of LGBTQ Pride Month.
- Add code to the correct parts of a program.

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

Learning Activity: Do Now.

Students research about LGBTQ Pride Month

Whole-class discussion

Students use information to add to a program that was already made

Student Assessment/CFU's: observation, questioning

Materials: Chromebook/computer, articles about LGBTQ Pride

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

Differentiation/Modifications: peer tutoring, provide additional code for students who need it, have articles translated into Spanish

Integration of Technology: use of trinket.io/turtle, use of Chromebook/computer

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