Unit 5 - Creating in Python - Pygames

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Pygames, Creating Programs and Games in Python

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Introduction to Python, Grades 9-12

Creating in Python - Pygames

Belleville Board of Education

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Unit Overview

In this unit students will learn how to create graphical applications and games using powerful Python frameworks, Turtle and Pygame

Students will apply programming concepts they have already learned, and learn new coding skills to create adventures and fun games and other applications, like digital visual arts, cube.oi game and a paint application.

Enduring Understanding

The Enduring understandings in the unit are:

- Pygame is about the differences between programming with pygame programming and

standard procedural programming.
- Learning includes implementing event loops, drawing items on the screen, playing sound effects and music, handling user input.

Essential Questions

What can you create in Python, Pygames?

How can you apply your Python and problem solving skills?

Examples include a text-based number guessing game. I'm particularly fond of this as a teaching tool since it contains many of the basic concepts of text-based programming - including data types, sequence, conditionals and iteration. Learners get to create their own different versions of the game (forking), for example, more difficult and ridiculously easy versions

Exit Skills

Throughout this unit, students have learned how game programming with `pygame` differs from standard procedural programming.
Students also learned how to:

- Implement event loops
- Draw items on the screen
- Play sound effects and music
- Handle user input

New Jersey Student Learning Standards (NJSLS-S)

8.1.12.AP.1	Design algorithms to solve computational problems using a combination of original and existing algorithms.
8.1.12.AP.3	Select and combine control structures for a specific application based upon performance and readability, and identify trade-offs to justify the choice.
8.1.12.AP.8	Evaluate and refine computational artifacts to make them more usable and accessible.
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.
8.2.12.ED.3	Evaluate several models of the same type of product and make recommendations for a new design based on a cost benefit analysis.
8.2.12.ED.6	Analyze the effects of changing resources when designing a specific product or system (e.g., materials, energy, tools, capital, labor).
TECH.8.1.12	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.8.1.12.A.CS1	Understand and use technology systems.
TECH.8.2.12.E.1	Demonstrate an understanding of the problem-solving capacity of computers in our world.
TECH.8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).
TECH.8.2.12.E.4	Use appropriate terms in conversation (e.g., troubleshooting, peripherals, diagnostic software, GUI, abstraction, variables, data types and conditional statements).
TECH.8.2.12.E.CS1	Computational thinking and computer programming as tools used in design and engineering.

Interdisciplinary Connections

Python is widely used in scientific and numeric computing:

- SciPy is a collection of packages for mathematics, science, and engineering.

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.
SCI.HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and

trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Learning Objectives

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

Effective Learning Objectives Used in Lesson Planning:

- Begin with an action verb from one or more of Bloom's Taxonomy castegories listed below;
- Are measurable and/or observable, using action verbs, such as "differentiate," "classify," "justify;"
- Are not vague or passive verbs, such as "understand," "remember;"
- Increase the use of of verbs from Bloom's Taxonomy's higher order thinking categories, including **Analyze** and **Evaluate**
- Construct authentic learning activities and assessments that are derived from the Bloom's Taxonomy category - **Create**
- Minimize the use of lower order thinking categories - Remember and Understand.

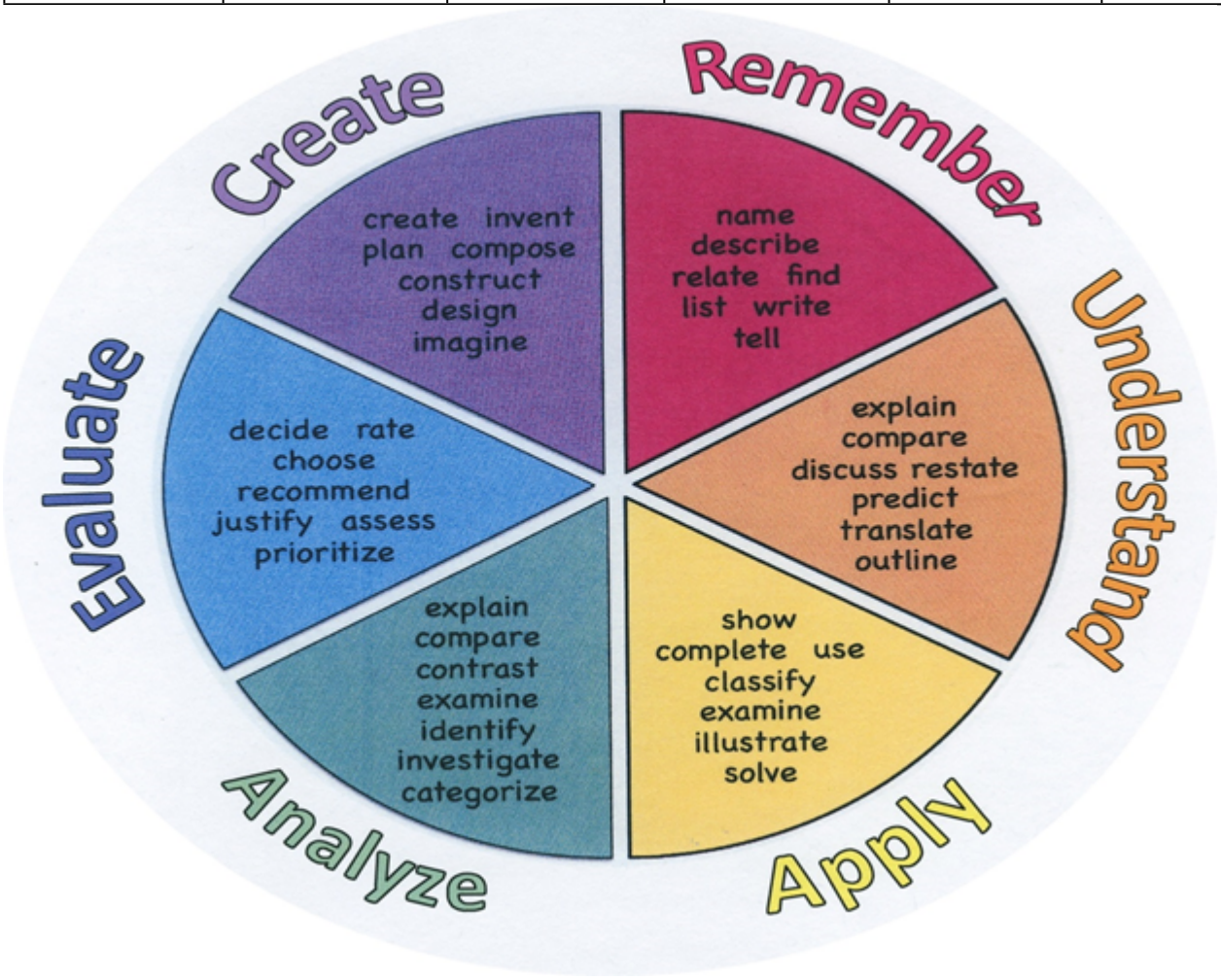
Examples:

- **Identify** nutrients found in common food sources using the product's nutrition label;
- Use computer dietary analysis to assess a 2-day dietary intake and **categorize** the results;
- **Research** nutrition-related information on the internet and **evaluate** the reliability of the information.

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

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

Guidelines for Suggested Activities:

- Includes activities **appropriate & specific** to the development of the Unit;
- Is comprised of the variety of learning activities that will be referenced in lesson plans, constructed/developed and instructionally delivered in the classroom;
- Are authentic;
- Recognizes the learning styles of the students;

- Integrates problem- or project-based learning.

Assessment Evidence - Checking for Understanding (CFU)

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

By identifying the **Evidence of Student Learning with Checking for Understanding (CFU)** techniques used during the lesson and/or for Closure (Madeline Hunter), please list the variety of means used to access students' learning (e.g. quizzes, tests, academic prompts, observations, homework, journals).

- 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 Chart
- 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

Ancillary Resources

1. LightBot
2. SpriteBox
3. Hour of Code
4. Code.org
5. Scratch
6. Grasshopper App
7. CS First

Primary Resources & Materials

Code Combat Platform, Code.org Platform, Game Salad Platform

Technology Infusion

Technology is infused throughout the unit, Computer Science



Alignment to 21st Century Skills & Technology

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

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.

CAEP.9.2.12.C.1	Review career goals and determine steps necessary for attainment.
CAEP.9.2.12.C.2	Modify Personalized Student Learning Plans to support declared career goals.
CAEP.9.2.12.C.3	Identify transferable career skills and design alternate career plans.
CAEP.9.2.12.C.5	Research career opportunities in the United States and abroad that require knowledge of world languages and diverse cultures.

21st Century Skills/Interdisciplinary Themes

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/Interdisciplinary Themes** that will be incorporated into this unit.

- 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

LA.RH.6-8.1	Cite specific textual evidence to support analysis of primary and secondary sources.
LA.RH.6-8.5	Describe how a text presents information (e.g., sequentially, comparatively, causally).
	Functions

21st Century Skills

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

TECH.8.1.12	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.

Differentiation

- Exemplars
- Show students how to find the hints, methods reference cards, error messages, and sample code provided within each level.
- Students struggling with a given level will be automatically directed to additional practice levels within the game.
- Meeting with small groups to re-teach an idea or skill for struggling learners, or to extend the thinking or skills of advanced learners.

. Varying the length of time a student may take to complete a task in order to provide additional support for a struggling learner or to encourage an advanced learner to pursue a topic in greater depth.

Using rubrics that match and extend students' varied skills levels

Differentiations:

- 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 allowed
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & 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:

- 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 circles
- Multiple intelligence options
- Multiple texts
- Personal agendas
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products
- Varying organizers for instructions

Lo-Prep Differentiations

- 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)

- **Exemplars**
- If students struggle with breaking down problems, you can use the printable Engineering Cycle Worksheet to reinforce a step-by-step problem-solving approach.
- If students struggle to follow correct syntax, provide a copy of the printable Python Syntax Guide or JavaScript Syntax Guide

IEP:

1. Adherence to the students' Individualized Learning Plan.

2. Students will have extra time or fewer assignments, one-to-one assistance, and group work will often be enlisted.

3. Students may use speech-to-text or audio/video record assignments

4. Teacher may adapt learning style to fit the needs of the child.

5. Teacher will use graphic organizer to visually help students plan out their work.

6. The teacher will scaffold the lesson with a slow release from assisted support with guided practice to independent practice.

7. Front-loaded notes to enable students to more accurately follow along with teacher's instruction.

8. Step-by-step directions written out for students.

504:

1. Any necessary accommodations will be made as outlined in students' 504 plan.

2. Preferential seating while teacher is lecturing, explaining, etc.

3. Extended time on projects or assessments.

4. Verbal, visual or technology aids.

5. Use of digital audio-visual materials, such as YouTube, to assist the child with directions.

6. Students will have access to "How To" videos, so they may more easily follow along with directions for their assignments.

- 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: English Language Learners: 1. Most of the games have instructions available in other languages, and Google translate will be used as necessary. Students will be allowed to work with partners. 2. Sheltered Instruction Observation Protocol (SIOP) – instructional model that helps teachers plan and deliver lessons that allow English learners the ability to acquire academic knowledge as they develop English language proficiency. 3. Provide leveled texts or translations

by using Google Chrome Extension: Snap&Read, which is a reading tool that can cover the most diverse reading needs. It features Read Aloud, Dynamic Text Leveling, Translation, and Study tools, such as pulling text into an outline, then organizing it and adding notes. 4. Teacher creates a culturally responsive classroom. 5. Teacher employs teaching strategies and learning resources that make content comprehensible. 6. Teacher employs Total Physical Response (TPR) – uses a direct action to help students internalize new language

Using videos, illustrations, pictures, and drawings to explain or clarify

- 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:

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.

Intervention Strategies that will be employed in the unit, using the ones identified below.

- 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)

Gifted and Talented:

1. Students will have the opportunity to publish their writing (reviews/analysis) online, submit their projects to developers, and enter in game design competitions. They may also extend their investigation to some video games, possibly extending their final projects into another format.

2. Teacher can use a pre-assessment to determine students' knowledge of standard being taught in lesson and then provide an extension activity for students

3. Compact lesson

4. Provide students with problem-based learning activity using multiple standards from the unit.

Higher order, critical & creative thinking skills, and discovery

Talented and Gifted adaptations that will be employed in the unit, using the ones identified below.

- 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

Import

First we must import the pygame package. Since pygame version 1.4 this has been updated to be much easier. Most games will import all of pygame like this.

```
import pygame
from pygame.locals import *
```

The first line here is the only necessary one. It imports all the available pygame modules into the pygame package. The second line is optional, and puts a limited set of constants and functions into the global namespace of your script.

An important thing to keep in mind is that several pygame modules are optional. For example, one of these is the font module. When you "import pygame", pygame will check to see if the font module is available. If the font module is available it will be imported as "pygame.font". If the module is not available, "pygame.font" will be set to None. This makes it fairly easy to later on test if the font module is available.

Init

Before you can do much with pygame, you will need to initialize it. The most common way to do this is just make one call.

```
pygame.init()
```

This will attempt to initialize all the pygame modules for you. Not all pygame modules need to be initialized, but this will automatically initialize the ones that do. You can also easily initialize each pygame module by hand. For example to only initialize the font module you would just call.

```
pygame.font.init()
```

Note that if there is an error when you initialize with "pygame.init()", it will silently fail. When hand initializing modules like this, any errors will raise an exception. Any modules that must be initialized also have a "get_init()" function, which will return true if the module has been initialized.

It is safe to call the init() function for any module more than once.

Quit

Modules that are initialized also usually have a quit() function that will clean up. There is no need to

explicitly call these, as pygame will cleanly quit all the initialized modules when python finishes.

Unit Name:

NJSLS:

Interdisciplinary Connection:

Statement of Objective:

Anticipatory Set/Do Now:

Learning Activity:

Student Assessment/CFU's:

Materials:

21st Century Themes and Skills:

Differentiation/Modifications:

Integration of Technology: