Unit 4 - Intermediate Python programming concepts

Content Area: **Sample Content Area**
Course(s): **Sample Course**
Time Period:
Length: **Sample Length & Grade Level**
Status: **Published**

Branching - While Loops - Strings - Lists - For Loops - Functions

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Introduction to Python, Grades 9-12

Intermediate Python

Belleville Board of Education

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Board Approved:

Unit Overview

In this unit students will...

Understand Python Loops:

- While Loop. The while loop will run as long as the variable “counter” is below 3. We print a message, then increase the...
- Break. With the break statement, we can exit the while loop even though the while condition equals true. ... When the...
- Continue Statement. The continue statement stops the current iteration and continues with the next one. ...

Identify differences between “while” loops and “for” loops

Use “for” loops to iterate through lists and manipulate each element

Count the number of shared letters in two strings and reverse strings

Iterate over a range of numbers and on indexes

Create programs to count calendar days depending on the year

Use nested loops for drawing shapes and images

Create lists in Python

Search and alter elements of lists

Use indexes to find particular elements or to create new lists

Perform operations on every element in a list using loops

Create programs to calculate statistics

Sort lists alphabetically

Add, remove, and count values in a list

Use lists as arguments in different functions

Enduring Understanding

This unit introduces students to software development using the Python programming language.
The unit begins by focusing on the motivation for programming and then teaches the fundamentals of procedural programming, including data storage and retrieval, sequence, selection, iteration, and functions.
This unit plays a pivotal role that allows subsequent units to challenge students to implement their own code to investigate their virtual world.

Essential Questions

- What does it mean for something to be mutable? (A value can be modified after being created.)
- Can lists be modified? If so, who can give an example? (Yes. For example, you can change the element at a certain index by assigning a new value to it.)
- Can strings be modified? If so, who can give an example? (No)
- How is “list.sort()” different from “sorted(list)?” (Calling “list.sort()” modifies the original list, while “sorted(list)” returns a new list.)

How are loops helpful?

Who can describe one way you applied loops in today's lesson?

Why is it important to indent your code?

How is a "while" loop different from an "infinite" loop?

Exit Skills

Programmers integrate algorithms and abstraction to create programs for creative purposes and to solve problems.
Using multiple program statements in a specified order, making decisions, and repeating the same process multiple times are the building blocks of programs.
Incorporating elements of abstraction, by breaking problems down into interacting pieces, each with their own purpose, makes writing complex programs easier.
Programmers need to think algorithmically and use abstraction to define and interpret processes that are used in a program.

In this unit Students will learn the essential concepts of Python programming and gain knowledge in data analytics, and natural language processing. Students will become more familiar with the essential concepts of data types, tuples, lists, dicts, basic operators, and functions.

New Jersey Student Learning Standards (NJSLS-S)

8.1.12.NI.1	Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, servers, topology, and addressing.
8.1.12.NI.4	Explain how decisions on methods to protect data are influenced by whether the data is at rest, in transit, or in use.
IC	Impacts of Computing
	Individuals select digital tools and design automated processes to collect, transform, generalize, simplify, and present large data sets in different ways to influence how other people interpret and understand the underlying information.
	Individuals evaluate and select algorithms based on performance, reusability, and ease of implementation.
8.1.12.AP.1	Design algorithms to solve computational problems using a combination of original and existing algorithms.

Interdisciplinary Connections

TECH.8.1.12.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.
TECH.8.2.12	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.8.2.12.A	The Nature of Technology: Creativity and Innovation: Technology systems impact every aspect of the world in which we live.
	Functions
	Connections to Expressions, Equations, Modeling, and Coordinates.

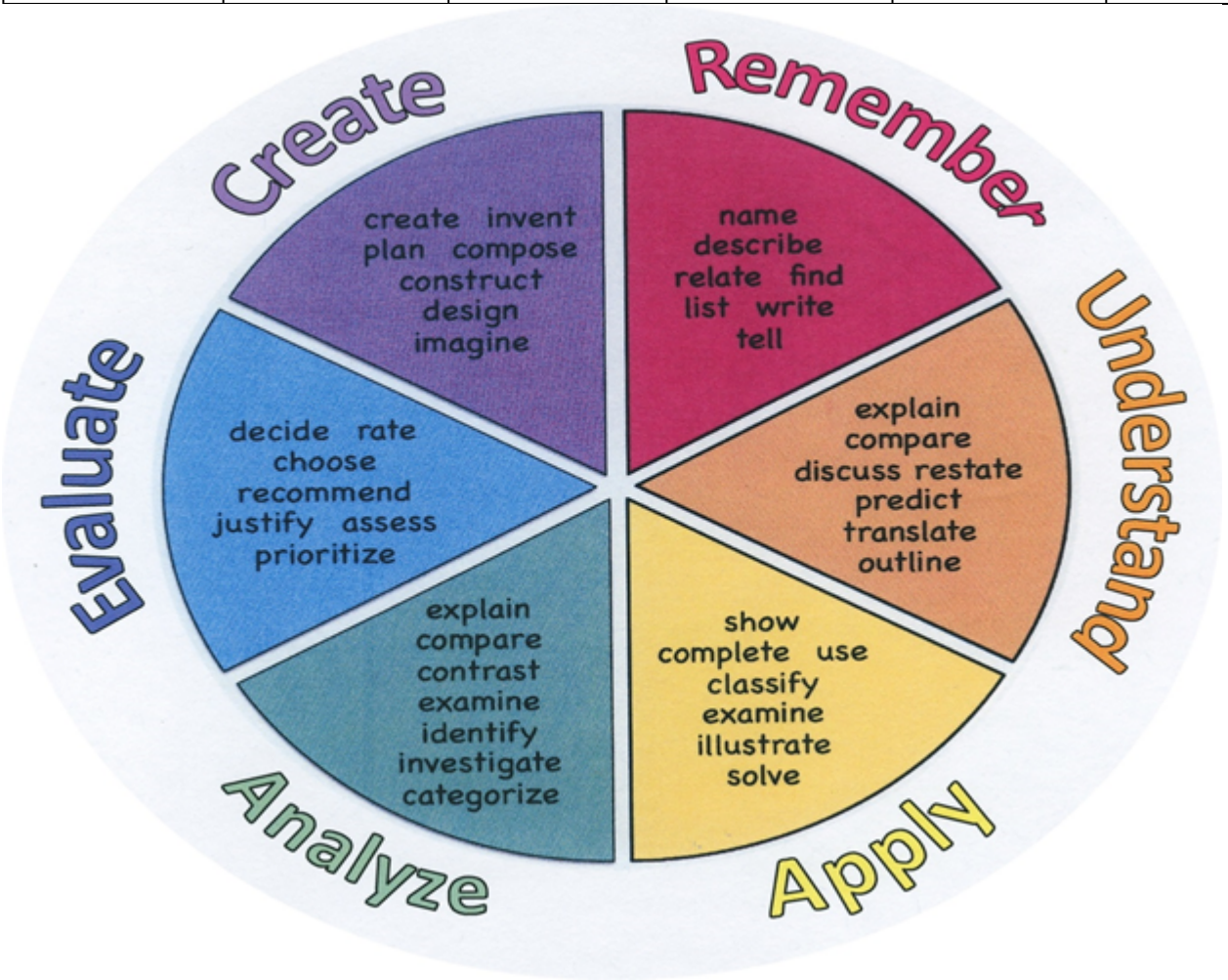
Learning Objectives

The students will:

- Be able to define and utilize variables
- Be able to distinguish between the variable types of integer and string

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 Select State Count Draw Outline Point Quote Recall Recognize Repeat Reproduce	Interrelate Interpret Infer Match Paraphrase Represent Restate Rewrite Select Show Summarize Tell Translate Associate Compute Convert Discuss Estimate Extrapolate Generalize Predict	Show Sketch Solve Use Add Calculate Change Classify Complete Compute Discover Divide Examine Graph Interpolate Manipulate Modify Operate Subtract	Survey Arrange Breakdown Combine Detect Diagram Discriminate Illustrate Outline Point out Separate	Grade Justify Measure Rank Rate Support Test	Organize Plan Produce Role Play Drive Devise Generate Integrate Prescribe Propose Reconstruct Revise Rewrite Transform



Suggested Activities & Best Practices

Data Types and Variables is covered in the two videos below. Click play on the first video to start the lesson. This lesson includes programming, so be sure to pause the videos to edit and write code in the programming environment when prompted.

Students can also download the slides used in the videos

1.7 Data Types and Variables: CS Python Fundamentals (projectstem.org)

Lesson 09: Python Loops | Python for Digital Humanities (pythonhumanities.com)

Python For Loop | How To Use Python For Loops? | For Loops □ IpCisco

Assessment Evidence - Checking for Understanding (CFU)

Unit test-summative assessment

Evaluation rubric-formative assessment

Multimedia reports-alternate assessment

Create a Multimedia poster-benchmark 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 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

Core Python lesson-1 | From scratch to loops | by Ahin Das | Jul, 2021 | Medium

Python For Loop | How To Use Python For Loops? | For Loops □ IpCisco
loops elesson in python - Bing video

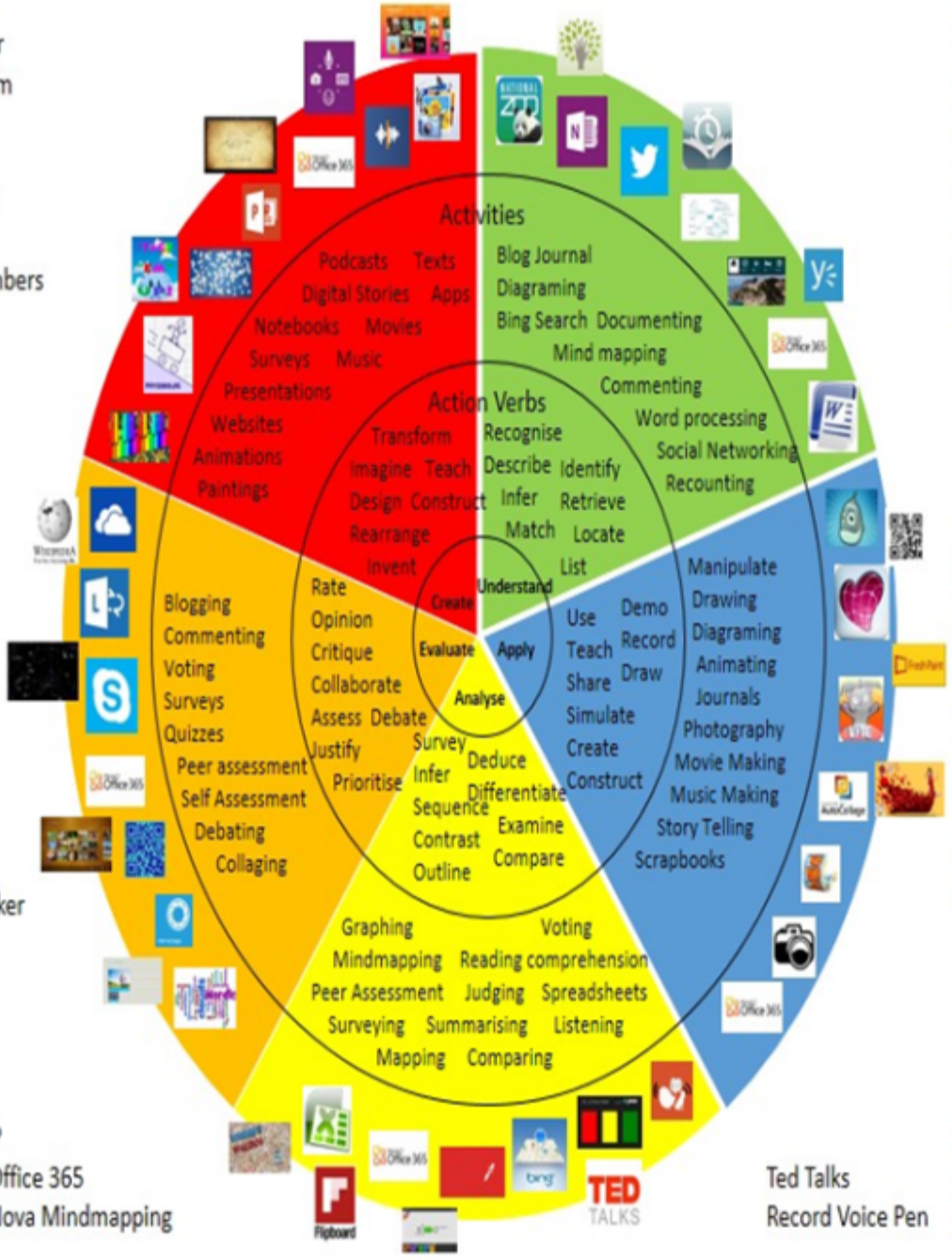
Technology Infusion

Technology Infusion is 100% infused in this course

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

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.3	Identify transferable career skills and design alternate career plans.
CAEP.9.2.12.C.9	Analyze the correlation between personal and financial behavior and employability.

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

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.

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

CAEP.9.2.12.C Career Preparation

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
- 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

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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

English Language Learning adaptations that will be employed in the unit, using the ones identified in the list below.

- 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 in the list 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 in the list 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

https://youtu.be/4dN4Cn4u2M0
The Basics of Python Loops (simplilearn.com)

Using the template below, please develop a **Sample Lesson** for the first unit only.

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: