Lesson 9: 2D Arrays and Lists

In this lesson, students will learn about 2D arrays and lists. They will understand the concept of a 2D array as a collection of arrays, where each array represents a row and contains elements. They will also learn that lists are collections of items that are ordered and changeable, and can contain any type of data, including other lists. Students will practice accessing and modifying elements in a 2D list, as well as appending new rows or columns. They will also have the opportunity to apply their knowledge by creating their own password manager programs using 2D lists. By the end of the lesson, students will have a solid understanding of 2D arrays and lists and their applications in programming.

## **Objectives:**

By the end of this lesson, students will be able to:

- Define a 2D array and a list.

- Use a 2D list in a program.

## **Materials:**

- Whiteboard or projector

- Markers or chalk

- Computers or laptops with Python IDE installed

- Handouts with practice exercises

- Password manager program template (optional)

## **Bell-Ringer Activity (5 minutes):**

1. Display the following code on the board:

```python

numbers = [[1, 2, 3], [4, 5, 6], [7, 8, 9]]

print(numbers[1][2])

```

2. Ask the students to identify the output of the code.

3. Allow a few students to share their answers and explain their reasoning.

## **Introduction (10 minutes):**

1. Begin by explaining the concept of a 2D array and a list.

2. Define a 2D array as a collection of arrays, where each array represents a row and contains elements.

3. Define a list as a collection of items that are ordered and changeable.

4. Explain that lists can contain any type of data, including other lists.

5. Provide examples of real-life scenarios where 2D arrays and lists are used, such as spreadsheets or matrices.

## **Direct Instruction (20 minutes):**

1. Demonstrate how to access lists and single items in a 2D list using indexing.

2. Explain that indexing starts at 0 in Python.

3. Show examples of accessing specific elements in a 2D list using both row and column indices.

4. Discuss the importance of understanding the structure of the 2D list to access the correct elements.

5. Provide additional examples and allow students to practice accessing elements in a 2D list.

## **Guided Practice (20 minutes):**

1. Distribute handouts with practice exercises.

2. Instruct students to work in pairs or small groups to complete the exercises.

3. Circulate the classroom to provide assistance and answer any questions.

4. After the allotted time, review the answers as a class and address any misconceptions.

## **Independent Practice (30 minutes):**

1. Introduce the concept of changing and appending a 2D list.

2. Demonstrate how to modify specific elements in a 2D list using indexing.

3. Show examples of appending new rows or columns to a 2D list using the `append()` method.

4. Provide a password manager program template (optional) and explain the task.

5. Instruct students to work individually to create their own password manager programs using 2D lists.

6. Encourage students to test their programs with different inputs and handle any errors or exceptions.

7. Allow students to share their programs with the class and discuss their approaches.

## **Exit Ticket (5 minutes):**

1. Distribute exit tickets to each student.

2. Ask students to write down one thing they learned about 2D arrays and lists during the lesson.

3. Collect the exit tickets before the end of the class.

## **Closure (5 minutes):**

1. Review the main concepts covered in the lesson, including the definition of a 2D array and a list.

2. Emphasize the importance of understanding and using 2D arrays and lists in programming.

3. Encourage students to continue practicing and exploring the applications of 2D arrays and lists in their own projects.

4. Thank the students for their participation and effort during the lesson.

**Common Core Standards:**

- CCSS.ELA-LITERACY.RST.9-10.3 - Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

- CCSS.ELA-LITERACY.RST.9-10.4 - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.