Lesson 4: Introduction to Bubble Sort

This lesson introduces students to the concept of sorting data and specifically focuses on the bubble sort algorithm. Students will learn why computers often need to sort data and how sorting algorithms can automate this process. The steps of the bubble sort algorithm will be explained and demonstrated, and students will have the opportunity to practice performing a single pass and a full bubble sort on a given list of words. The lesson emphasizes the importance of understanding the algorithm and its limitations, and encourages students to explore other sorting algorithms.

## **Objectives:**

- Students will be able to identify why computers often need to sort data.

- Students will be able to traverse a list of items, swapping the items that are out of order.

- Students will be able to perform a bubble sort to order a list containing sample data.

## **Materials:**

- Whiteboard or chalkboard

- Markers or chalk

- Worksheets with sample data (words)

- Alphabet chart (optional)

## **Bell-Ringer Activity:**

1. Display a list of words on the board: "cat", "dog", "apple", "banana", "zebra".

2. Ask students to think about how they would arrange these words in alphabetical order.

3. Give students a few minutes to discuss with a partner or write down their thoughts.

4. Ask a few students to share their ideas with the class.

## **Introduction:**

- Explain to students that sorting data is an important task in computer science and in everyday life.

- Discuss with students why computers often need to sort data (e.g. to organize information, to make searching easier).

- Emphasize that sorting algorithms are used to automate the process of sorting data.

- Introduce the concept of bubble sort as the first sorting algorithm in this unit.

- Explain that bubble sort works by repeatedly swapping adjacent elements if they are in the wrong order.

- Mention that bubble sort is a simple algorithm but not efficient for large sets of data.

## **Direct Instruction:**

1. Write the following steps of the bubble sort algorithm on the board:

- Compare the first two elements of the list.

- If the first element is greater than the second element, swap them.

- Move to the next pair of elements and repeat the comparison and swapping process.

- Continue this process until the end of the list is reached.

- Repeat the above steps for multiple passes until the list is fully sorted.

2. Explain each step in detail, using examples and diagrams if necessary.

3. Demonstrate how to perform a single pass of bubble sort on a sample list of words.

4. Emphasize the importance of understanding the crux of the algorithm before moving on to multiple passes.

## **Guided Practice:**

1. Distribute worksheets with sample data (words) to each student.

2. Instruct students to perform a single pass of bubble sort on the given list of words.

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

4. After students have completed the single pass, discuss the results as a class.

5. Ask students to share their thought process and any challenges they encountered.

## **Independent Practice:**

1. Instruct students to perform a full bubble sort on the same list of words from the guided practice.

2. Encourage students to work independently and use the steps of the algorithm written on the board as a guide.

3. Monitor students' progress and provide support as needed.

4. Once students have completed the bubble sort, ask them to compare their sorted list with their classmates.

## **Exit Ticket:**

1. Give students a short exit ticket to assess their understanding of bubble sort.

2. Ask students to explain in their own words how bubble sort works and when it might be useful.

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

## **Closure:**

- Recap the main points of the lesson, including the objectives and the steps of bubble sort.

- Emphasize that bubble sort is a stepping stone to other more efficient sorting algorithms.

- Discuss briefly the ways to improve the efficiency of bubble sort, such as stopping if no swaps are made on a single pass and reducing the number of comparisons by one after each pass.

- Remind students that sorting data is a fundamental concept in computer science and has real-life applications.

- Encourage students to practice bubble sort and explore other sorting algorithms on their own.

## **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.