**Algorithm Activity Lesson Plan**

**Finding a Minimum in an Array of Objects**

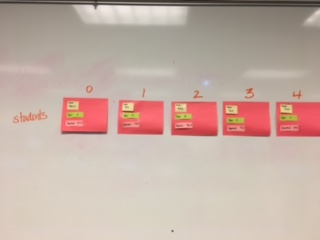
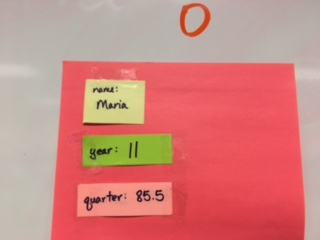
**Introduction**

After students have mastered writing standard algorithms for arrays of ints, it is time to move on to arrays of objects! This is often a huge leap for students to understand. However, with some visuals, students start to see how working with objects comes together.

**Instructions**

* Have students write a Student class. The Student class should have at least the following:
* A String private instance variable for the name
* An int private instance variable for the year in school (9-12)
* A double private instance variable for the quarter average.
* An overloaded constructor with parameters to set each private instance variable
* All necessary accessor methods for each private instance variable
* All necessary modifier methods for each private instance variable
* A toString method that returns the name, year and quarter average
* Have students write a Roster class. The Roster class should have at least eh following:
* An array holding objects of type Student private instance variable called students
* A default constructor that sets the size of the array to 5
* An overloaded constructor that sets the size of the array to a given parameter
* A method to enter students in the array
* A method to print students in the array

* Have students debug and run their programs. After students have running code for these classes, give the students a visualization of the array with five students in it. To do this, I use colored paper for the student and on each page of paper I use post-it notes for each variable as shown below.

** **

* Ask students to write out a method to return the minimum quarter score. Give students time to write out the code for this method. At this time, do not give them any hints and have them work alone.
* Ask students to compare answers with a partner and discuss.
* Lead a class discussion about how students started to think about this problem. Did they realize this method would be similar to the method they wrote for an array of ints?
* Now go over a solution that does not work; specifically one that uses students[i] for searching and holding the minimum. Using the visual, show if they access students[i] they get the entire Student (piece of large paper), not just the value of the quarter average. Ask students how they might get just the quarter average….hopefully they will realize the importance of the accessor method at this point!
* Students should not try to add methods for other standard algorithm variations. Some suggestions:
* public int numberOfGrade(int y) //returns the number of students in year y
* public String studentWithMax() //returns the name of the student with the maximum

//quarter average

* public boolean allUpperClassYear()//returns true if all students are year 10 or higher
* public double quarterAverage() //returns the average of the quarter averages

Follow-up: Have each student or pair of students create their own two classes, one an object and a second with an array of that object. The second class should have at least three variations of the standard algorithms.