Creating a **lesson plan**

for real world applications of

sorting algorithms

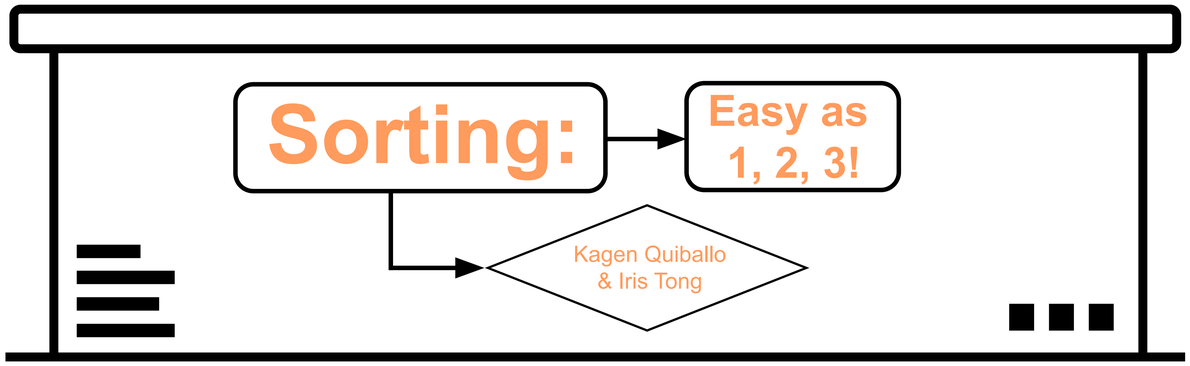
to cultivate an interest in

computer processing and coding

LESSON PLAN

ILLINOIS

MAA MATHEMATICAL ASSOCIATION OF AMERICA



CONTENT OBJECTIVES

- Students will **sort themselves** in birthday order and **write an algorithm** describing the process.
- Students will **define and test** out 4 different sorting algorithms: bubble sort, merge sort, insertion sort, and selection sort.
- Students will **compare and analyze** the efficiency of the 4 different sorting algorithms by sorting groups of objects.
- Students will **explore** how algorithms are used in computers and real life.

OVERVIEW

This lesson plan is designed for students in **grades six through eight** to explore the concepts of different sorting algorithms and how they are used in the real world.

Students will have the opportunity to create their own algorithm and sort themselves in real time. This lesson is **designed to last one hour.**

COMMON CORE STATE STANDARDS INITIATIVE
PREPARING AMERICA'S STUDENTS FOR COLLEGE & CAREER
&
K12 CS

- **Std.1** To look for and to make use of **structure**, as well as to look for and to express regularity in **repeated reasoning**
- **Std.2** To **classify objects** into given categories and **recognize patterns**
- **Std.3** To recognize different algorithms can achieve the **same result** while some are **more appropriate** in specific contexts

THE LESSON

In this 60 minute lesson, the teacher will need to prepare materials before-hand, introduce and direct activities, and facilitate discussions afterwards.

2-3 classroom aides may be beneficial to help students during the activities depending on the size of the class.

Countryside School
Illinois Geometry Lab
Undergraduate Outreach RSO

WARM-UP

ACTIVITY: 20 min.
DISCUSSION: 10 min.

ACTIVITY: The teacher needs students to sort themselves in birthday order as quickly as possible. The context is to remember which birthday to celebrate next.

DISCUSSION Q's:
What questions did you ask each other? What thoughts were running through your head? How did you place yourself in between two students?

GROUP WORK

ACTIVITY: 15 min.
PRESENTATION: 10 min.

BUBBLE SORT | MERGE SORT | INSERTION SORT | SELECTION SORT

PROCEDURE: In four separate groups, students will race against time to sort objects using sorting algorithms. Each group will be given a stopwatch, an instructional video for their respective sorting algorithm, objects to sort in an exciting scenario, and a list of guiding questions to answer when presenting their algorithm to the rest of the class.

GUIDING Q's FOR PRESENTATION: What is the name of your sorting algorithm? How does it work? (with a quick demonstration) How long did it take to finish sorting your object? Would this algorithm be more useful sorting fewer objects or more objects? Why? What is a real life application for this sorting algorithm?

CLOSURE & EXTENSION

DISCUSSION: 5 min.

CLOSURE: The teacher may discuss how algorithms relate to computer processing and coding, how efficiency varies in different scenarios, and how algorithms are applicable to real life situations

EXTENSION: Play the trailer of "The Secret Rules of Modern Living: Algorithms" by Marcus du Sautoy to get students excited about algorithms and computers. Encourage students to watch the full documentary on their own time on either Netflix or YouTube. Pass out a take-home sheet that describes all of the algorithms discussed in the activity.

CLASSROOM RESULTS

RESULTS

This activity was tested out in a classroom of five students at the Countryside School in Champaign, Illinois. Students had some previous experience with algorithms, and were highly engaged throughout the activity. Although the activity was designed for a larger classroom, the lesson plan was flexible enough to be adapted for a smaller group. Instead of working with four algorithms, two algorithms were discussed between two groups of two and three.

The videos we used in this activity were effective, but could have been more exciting for younger students to watch.

Overall, the activity was successful.

It was amazing to witness students reason through problems and discuss their thinking processes with each other.



FUTURE DIRECTIONS

In the future, we hope to test this activity out in a **larger classroom** (~20 students). We would also like to show a **computer simulation** of algorithms racing against each other to sort a group of objects, as well as create our own instructional videos for each algorithm we used.

REFERENCES

Instructional Algorithm Videos by Michael Sambol

"The Secret Rules of Modern Living: Algorithms" by Marcus du Sautoy