Connecting Industry to Mathematics Instruction
NSF ATE Award # 1954291

Virus Growth and Vaccine Production

A Practice Understanding Task

Purpose: In this lesson students will work with mathematical modeling to create a line of best fit in order to model virus yield from a given set of data. That model will be used to predict the ideal temperature to be used for growing the virus. In addition, the effectiveness of a new drug will be analyzed by creating a confidence interval to compare efficacy of a new drug to the efficacy of an older drug.

In partnership with

WAKE TECH

WAKE COUNTY PUBLIC SCHOOL SYSTEM

WakeEd PARTNERSHIP

Career Field
Biopharmaceutical Technology
Lesson inspired by Seqirus

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NC Math 4 Standards

NC.M4.AF.5.1 Construct regression models of linear, quadratic, exponential, logarithmic, & sinusoidal functions of bivariate data using technology to model data and solve problems.

NC.M4.SP.2.2 Construct confidence intervals of population proportions in the context of the data.

Unit Alignment
WTCC MAT110 – Statistics
WTCC MAT143 – Modeling, Statistical Analysis
WTCC MAT171 – Modeling, Applications of Functions

Common Core State Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.

Prerequisite Skills

These skills could be reviewed in a warm-up and are addressed in the Desmos Activity

- Create a scatterplot in Excel
- Create a trendline in Excel
- Create a confidence interval for a population proportion
- Evaluate a function when given an input or output value

Time Required

The time required to complete this activity is approximately **100** minutes. Students will have already seen the ideas required to insert a scatter plot and add a trendline.

Materials Needed

- Student Activity Sheet
- Excel
- Internet
- Calculator

The Teaching Cycle

Launch **(15 minutes, video will be up to 10 minutes of this):** The Desmos Activity Launch (opens in a new window) [plain text link: https://teacher.desmos.com/activitybuilder/custom/5f79c4e7d4c52f0ac731b48e?collections=5f6cae0049988f0bfcd6f9f8] contains the prerequisite material and a link to the Seqirus Video.

"COVID is a big deal, and for now, no FDA approved vaccine for the virus exists." Ask students:

- What skills are necessary for producing a vaccine?
- What types of disciplines are needed when working to produce a vaccine?
- What math concepts that we've discussed do you think are relevant for producing a vaccine?

(Begin video. Pause video once Girly explains modeling and statistical analysis are tools used for vaccine production.)

Give students an opportunity to complete #1 and #2 from the Student Activity Sheet. Make sure all students have completed #1. Discuss the answer to #2a with the class.

(Resume video. It will conclude with Girly presenting the problem for the class as a task to be completed in the industry environment.)

Explore

(50 minutes) Students will work in groups (ideally or 2-3). They will complete the attached Activity Sheet and Extension Questions as they continue practicing the ideas already established during the previous lecture. The teacher will facilitate this group activity by monitoring student participation, observing student interactions, and checking for mistakes in work as the teacher moves around the room. Guidance will be provided as determined necessary. For scaffolding, the teacher may suggest that the students create linear and quadratic models for the data. There is no need to explore models beyond those two.

Provide students the option to use Desmos, Excel, a calculator, or any other technology of their choice. During the discussion section, the teacher may ask students to share the technology they used and to share why.

Discuss

(35 minutes) Once the activity is complete, groups will share their answers with the rest of the class. Students will then be given the opportunity to identify any errors in their work and will have a chance to correct them before concluding the activity.

The teacher may ask students to defend their recommended model and to defend their recommended vaccine to the rest of the class to facilitate further discussion.

As homework, students will answer the Challenge Problems and be prepared to discuss answers during the next class meeting.

Exit Ticket

Answer the following question:

1. Use the data below to determine the ideal temperature under which to grow the given virus in order to maximize virus yield.

Temperature (°C)	Yield (ug/mL)
31	16.5
28	11.2
32	16.1
30	12.7
29	13.5
31	16.2
33	10.5
34	9.1