PBL Final Project

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H.S. Math (Algebra 1 ⟶ Stats)

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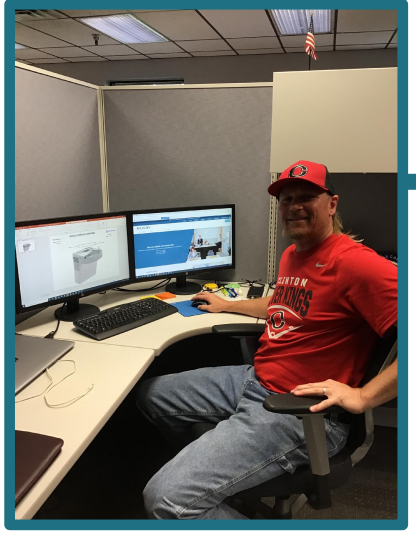
2021 extern at

ELKAY MANUFACTURING

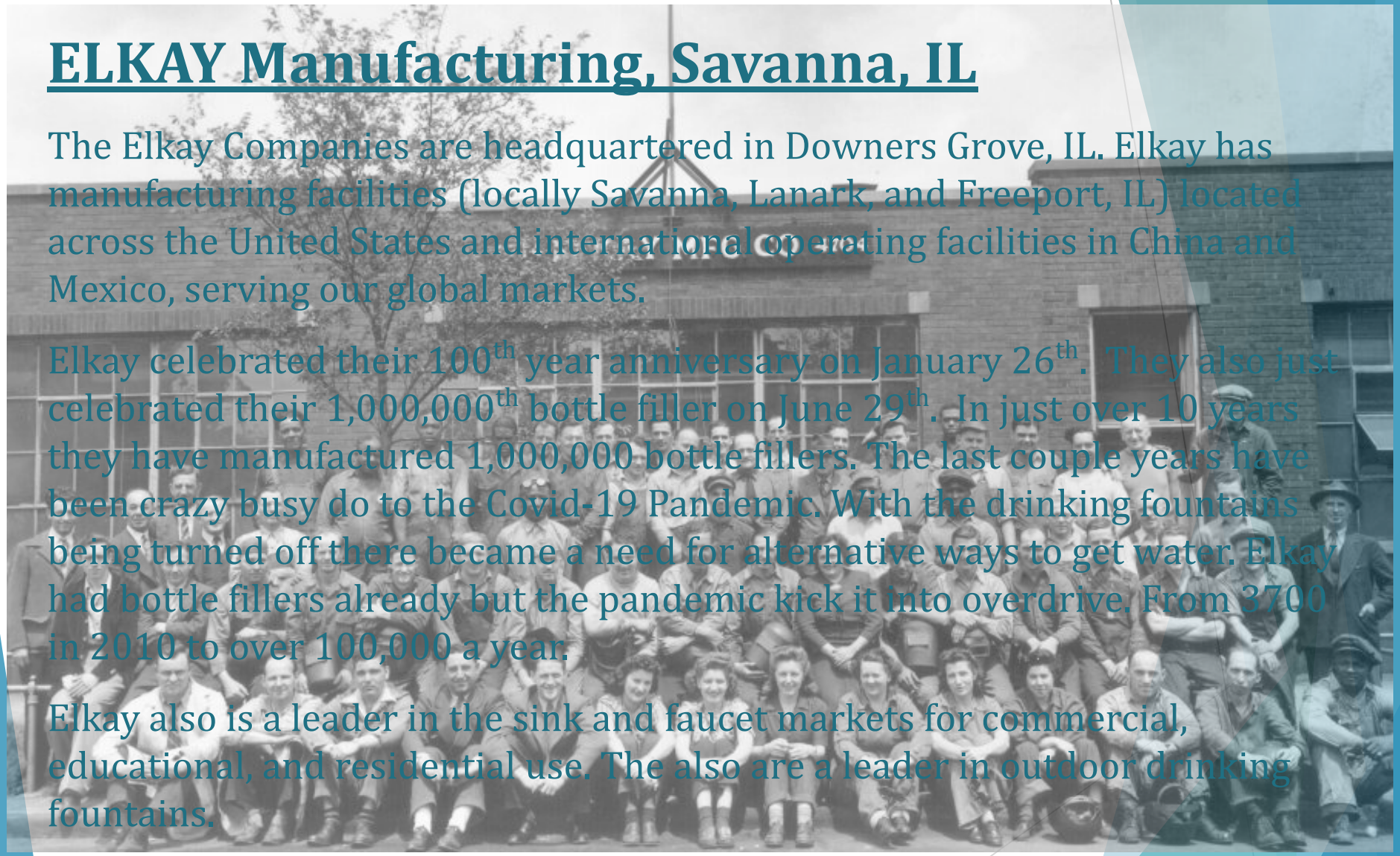
(Savanna, IL)



ELKAY®

100 YEARS

Part I: Overview of Workplace



ELKAY Manufacturing, Savanna, IL

The Elkay Companies are headquartered in Downers Grove, IL. Elkay has manufacturing facilities (locally Savanna, Lanark, and Freeport, IL) located across the United States and international operating facilities in China and Mexico, serving our global markets.

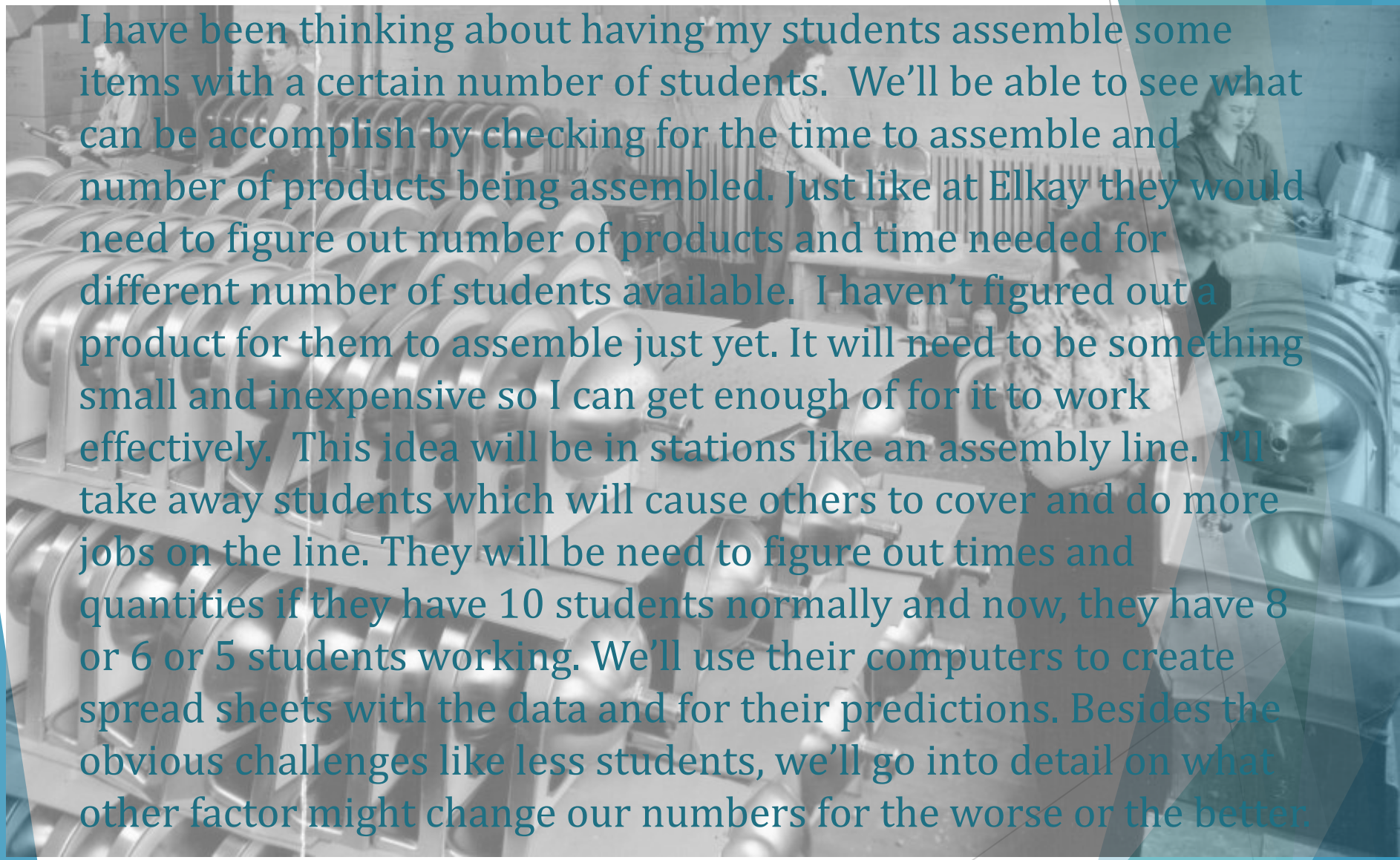
Elkay celebrated their 100th year anniversary on January 26th. They also just celebrated their 1,000,000th bottle filler on June 29th. In just over 10 years they have manufactured 1,000,000 bottle fillers. The last couple years have been crazy busy do to the Covid-19 Pandemic. With the drinking fountains being turned off there became a need for alternative ways to get water. Elkay had bottle fillers already but the pandemic kick it into overdrive. From 3700 in 2010 to over 100,000 a year.

Elkay also is a leader in the sink and faucet markets for commercial, educational, and residential use. The also are a leader in outdoor drinking fountains.

Part II: Workplace Focus

Here at Elkay Manufacturing they manufacture drinking fountains and bottle filers from start to finish. They have certain parts needed to create their products made by other vendors. Things like wiring harnesses, fittings, nut and bolts, etc. come from other vendors. Everything else is made and assembled onsite. There are different parts of the facility that produce the needed items to complete their products. There are multiple assembly lines here. There is a main line and then split off into several different finishing lines. The employees work in certain areas only for a couple hours then relocate with in the same line. Each worker needs to be able to do every part on the line. They have a certain number of workers normally on the line and at times some workers will be gone for various reasons. The remaining workers will have to pick up the pace to continue with production. This will cause some workers at times to double up on jobs. Sometimes workers will preassemble other items for down the line just to help the line moving smoothly. There really is no down time with a full crew or not. If you have a moment free you are still helping someone because it benefits the others as well as you.

Part III: Introduce the Problem



I have been thinking about having my students assemble some items with a certain number of students. We'll be able to see what can be accomplish by checking for the time to assemble and number of products being assembled. Just like at Elkay they would need to figure out number of products and time needed for different number of students available. I haven't figured out a product for them to assemble just yet. It will need to be something small and inexpensive so I can get enough of for it to work effectively. This idea will be in stations like an assembly line. I'll take away students which will cause others to cover and do more jobs on the line. They will be need to figure out times and quantities if they have 10 students normally and now, they have 8 or 6 or 5 students working. We'll use their computers to create spread sheets with the data and for their predictions. Besides the obvious challenges like less students, we'll go into detail on what other factor might change our numbers for the worse or the better.

Part IV: Standards, Driving and Essential Questions

Making Inferences and Justifying Conclusions

- **Understand and evaluate random processes underlying statistical experiments**
  - S-IC.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
  - S-IC.2 Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.

- **Make inferences and justify conclusions from sample surveys, experiments, and observational studies**
  - S-IC.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
  - S-IC.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
  - S-IC.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
  - S-IC.6 Evaluate reports based on data.

Main Driving and Underlying Questions

What are the duties of each worker? How much time does each worker take? How much total time is it for the task. How many things can the workers produce.

What can you do to increase production and decrease time on production? Can we assemble differently (steps) or more efficiently and then how? Is it better with certain workers doing certain job verses others. Would production increase by rotating each work to each station every so many minute/hours?

Part V: Extern Host Role

The role of the host is mostly already done. They have already provided me with the guidence and the experience to try this. If possible maybe a participent (Brandy Johnson, Quality Improvement Engineer) from Elkay can come and talk with my class. Maybe a short trip to Elkay for some onsite experience.

Part VI: Student Learning

Students will not have much choice in the activity until hey have participated in it. Once there is some data taken then that's where the students will be allowed to give some input. Some input will be in forms of large group discussion and others will be in their smaller group trying to do the calculations and what can be done to be more efficient. The task will not be in order of the procedure or set up to be smooth running. This how we will see the results of their input. The hope is they will see things or ways to be more efficient with what and who the have. They will have group reflections as well as individual reflection. There will be no need for them to have a revision. It will be a completion grade as a group and as individual.