GIFTED & TALENTED PROGRAM

INSTRUCTOR: JENNNIFFER DEWITT

FOOD, CHEMICAL, CIVIL & STRUCTURAL ENGINEERING

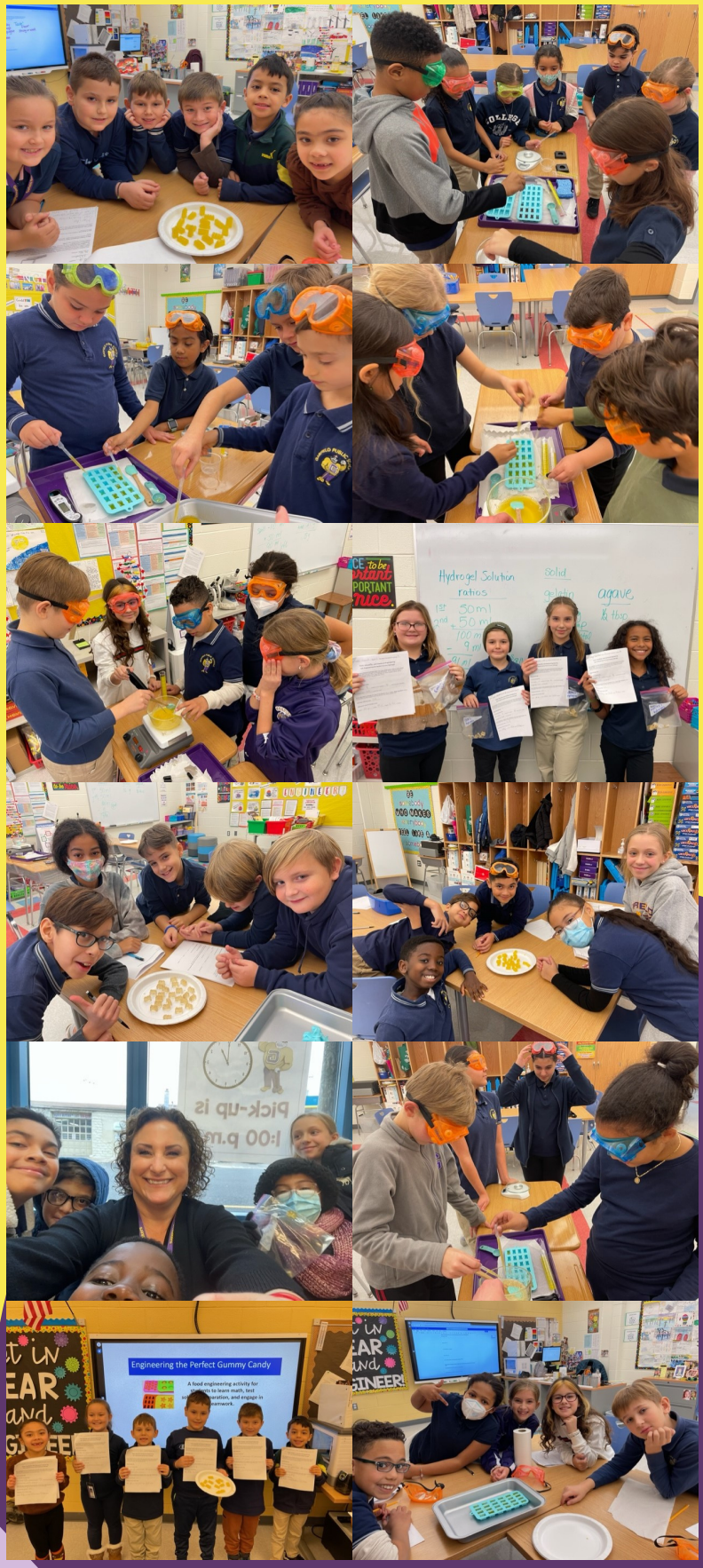
The gifted students explored the area of Food, Chemical, Civil, and Structural Engineering in trimester 2. The students were exposed to what these roles are and how they are important to society. It was a fun and exciting trimester as we built our way through the engineering design process.

FOOD ENGINEERING

Food, industrial, and chemical engineers work with food products to help enhance production techniques. Food engineers may help design new types of foods based on existing technologies to make the products we consume last longer. They also may work on ways to enhance the taste of certain types of foods so that a product has a uniform taste off the production line. Food manufacturing companies employ engineers for a variety of reasons. In this activity, the students became all of the above to engineer the perfect hydrogel gummy snack!

All hydrogels require the following: a proper measurement of ingredients, a proper ratio of ingredients, and a specified mixture sequence to ensure the hydrogel has the proper consistency and viscosity.

We discussed the different states of matter which are solid, liquid, and gas. A hydrogel is in between the state of a solid and a liquid. The students were challenged to make the perfect hydrogel in the form of gummy candy. There was NO recipe! First, they needed to know how much solution they needed to prepare to fill the silicon mold. Then, they were given 3 ingredients, but they had to determine the ratio of components to scale the final solution. The engineering design process was incorporated by allowing the students to decide on what quantity of gelatin will change the viscosity, and ultimately the taste of their edible hydrogel. We documented the results from our first recipe on a formal lab report. Then we modified our recipe based on our results to attempt to improve it and compared our results again.



Packaging Engineering

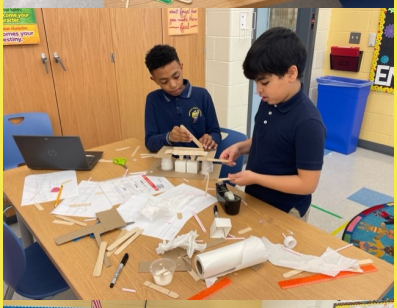
Food packaging engineers produce packages for all types of food that are both marketable and functional in selling the food. There are three important functions of food packages; to keep food clean; to protect the food product from unwanted physical and chemical changes (such as oxidation and destruction from insects); to facilitate non-desired physical changes (such as heating and cooling or breakage etc); and to identify the product and provide sales appeal. The students examined some different forms of packaging and the types of foods the packages held. They were told that they were now packaging engineers that were hired to create a package for a new type of pasta. After viewing the different packages, they began to brainstorm within their group to come up with a packaging design for the pasta keeping all of the important functions in mind. They drew their ideas and then collaborated with the group to combine each member's ideas for a final design. They measured out cardboard, designed the structure of their boxes, created an appealing design, and sealed their boxes to keep the pasta clean and protected. They made sure to include a barcode, a sell-by date, and nutrition facts! 😊

Civil & Structural Engineering
Bridge Unit

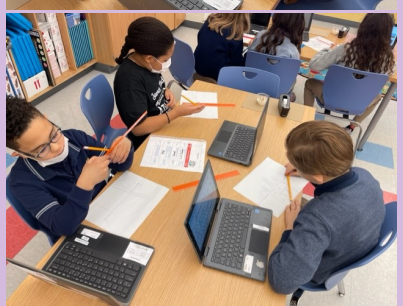
Our gifted students took on the role of civil and structural engineers. We began a unit of study on Bridges. This study continued for a couple of cycles/classes. Bridges are fascinating feats of engineering. Primarily civil and structural engineers are responsible for the design of bridges. Since bridges must be safe under all anticipated load and weather conditions in designing today's modern bridges, engineers take into consideration tension and compression forces. They also creatively strive to meet people's needs within budget and material constraints. There are countless design possibilities for beam, truss, arch, and suspension bridges. All are essential to the infrastructure of our world. Teams of engineers decide on the bridge type, design, and materials to best distribute the load across an obstacle, draw detailed design plans, specify materials, measurements, shapes, and angles for construction of the bridge, analyze site conditions, geologic and environmental factors, and budget/funding schedules.

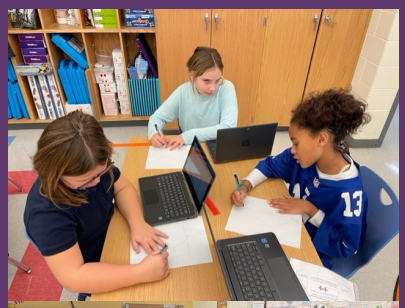
The students were presented with a brief history of bridges. They learned about the three main bridge types: beam, arch, and suspension. They were introduced to two natural forces — tension and compression — common to all bridges and structures. We discussed the different types of geometric shapes that provide the best support



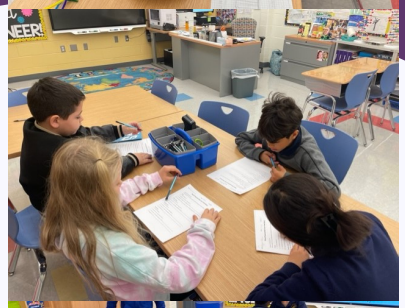










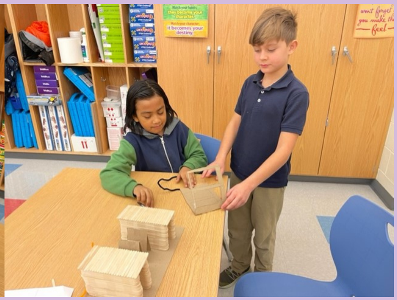
and durability for bridges. It turns out that the triangle is the strongest geometric shape and is commonly used in our society. It also explains why there are "M" and "A" supports in a variety of bridges as well as many more. The students did some research and took a look at pictures of all the different types of bridges. Then they created their own "blueprints" to plan out an effective and supportive design. The students collaborated in groups and took the best of each planned design to create a bridge prototype. They began constructing group prototypes of load-bearing bridges using measurements, calculations, compressive and tension forces, and the required materials. As they were building, they encountered many obstacles which made them sit back and think further about how to make modifications to their design plans. The students became more aware of the variety and value of bridges around us in our everyday lives and the importance of the engineers that design them. They understood just how important it is for engineers to be exact with all the details in order to create a bridge that will keep our society safe when crossing it. The construction process took careful thought and attention to detail.

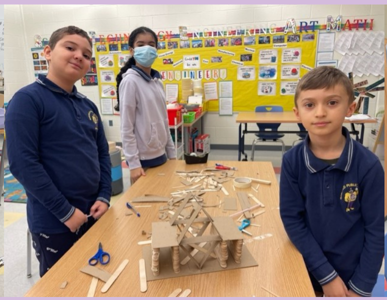




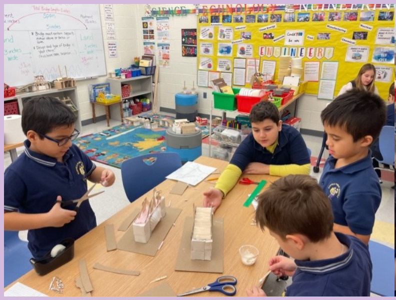


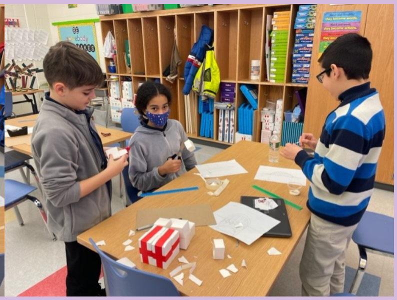






Get in GEAR and ENGINEER!



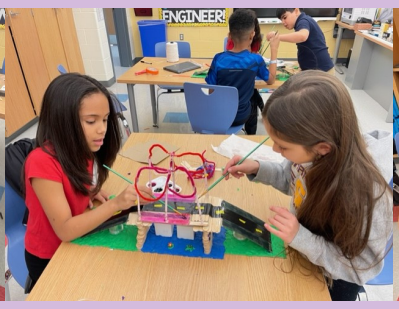

















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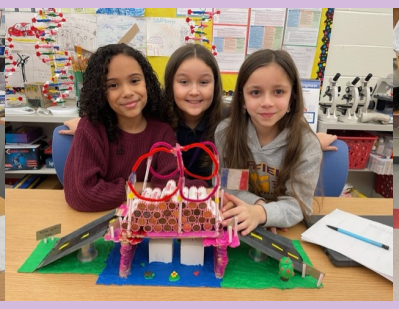


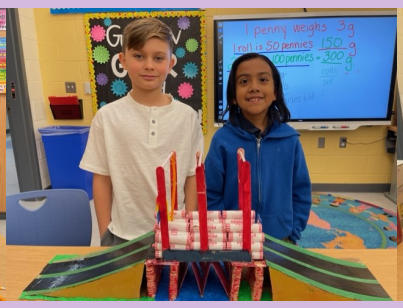
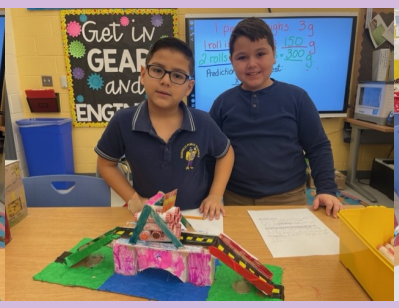
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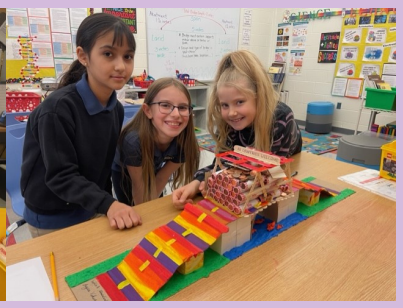
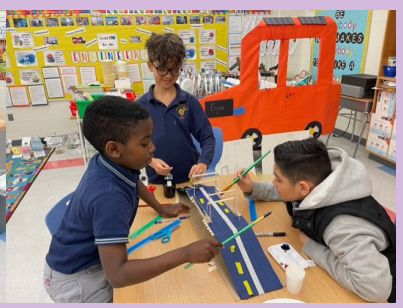


OUR BRIGHTEST WORK


OUR BRIGHTEST WORK


HOGWARTS

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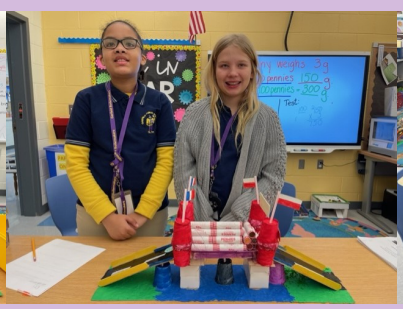




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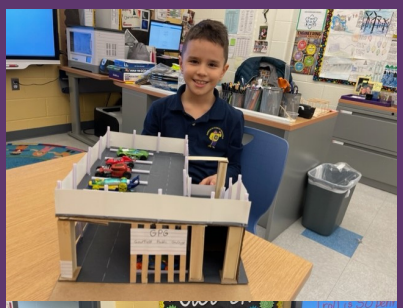
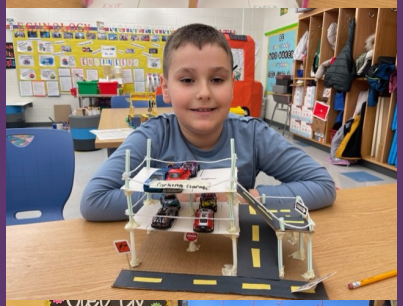
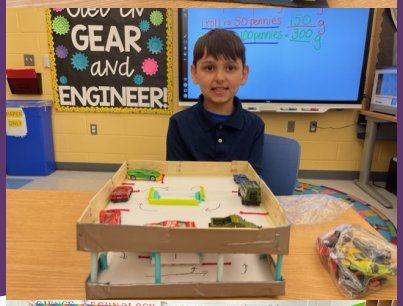






TRIMESTER 2 HOME PROJECT

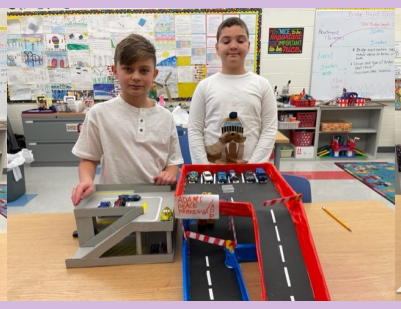
Requirements & Constraints

Modeling Parking Garages

The students further explored civil and structural engineering in this project. They learned the difference between architects and engineers. Their roles in building design can be similar. The architect is more concerned with the look of the structure, whereas the engineer is primarily concerned with the safety and functionality of the structure. The engineer figures out which materials to use and how to safely construct the structure the architect has envisioned.

The students experienced a bit of each profession by following a set of requirements and were given constraints as they created their own model parking garage. They were able to work through the Engineering Design Process as they planned, designed, built, and tested their models for strength and stability. The students drew a blueprint of their design and indicated on the blueprints precisely where the chosen materials will be used. They tested using Matchbox toy cars. The goal was to have 8 cars on the structure at the same time without collapsing to achieve structural strength. If the structure was weak in any area, the students were to modify their design to make it stronger. Then they were able to perform more tests for strength and stability.

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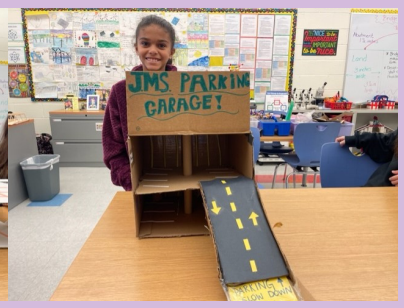
JMS PARKING GARAGE!



PARKING

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