Garfield Public Schools
Gifted & Talented Newsletter

Instructor: Jenniffer DeWitt – Trimester 2 - 2022 Edition

Yasser Delgado, School 5, Grade 5, completing his Apple Cultivation project.

Our Vision & Philosophy

The purpose of gifted and talented education is to provide opportunities for highly capable students to meet on a regular rotational basis and engage in units of studies, activities, contests, and projects that will foster individual intellectual interests and talents while promoting critical and creative thinking.

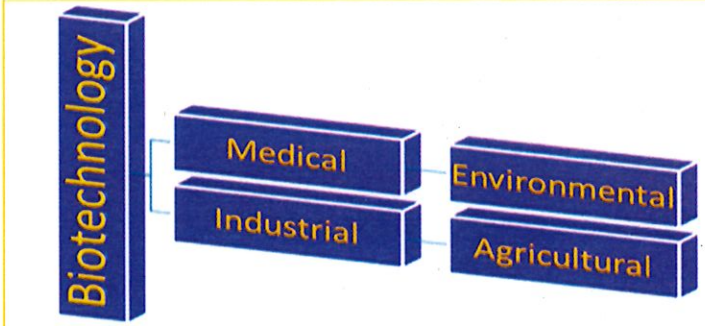
GREAT things are happening in the GIFTED classroom in GARFIELD!

The Gifts & Talents curriculum has been designed to foster complex, higher order thinking skills required for critical and creative thinking. **S.T.E.A.M.** is consistently infused throughout the year to ensure that students will be continuously engaged in meaningful activities. These learning opportunities offer advanced engineering concepts that will utilize prior knowledge of Science, Technology, Engineering, Art, and Math. Self-guided learning will develop individual gifts while communication and leadership are also supported.

Topic of Study: We are exploring the world of BIOTECHNOLOGY!

Our Essential Question:

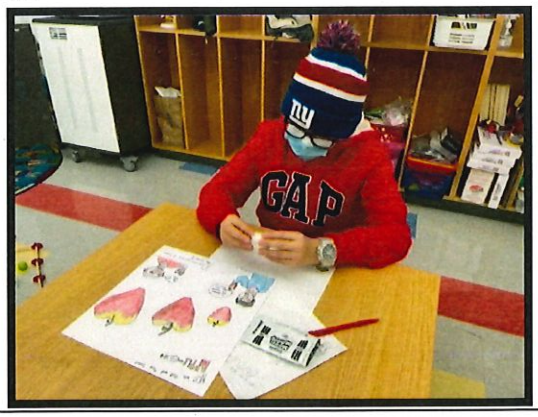
What is the different ways **biotechnology** can be used in the fields of medicine, agriculture, industry, the environment and forensic science?



**"Whatever you can do or dream you can, begin it.
Boldness has genius, power, and magic in it." – Johann Wolfgang von Goethe**

Gifted students taking part in a random selection of genes activity inspired by the great Gregor Mendel, the father of genetics.

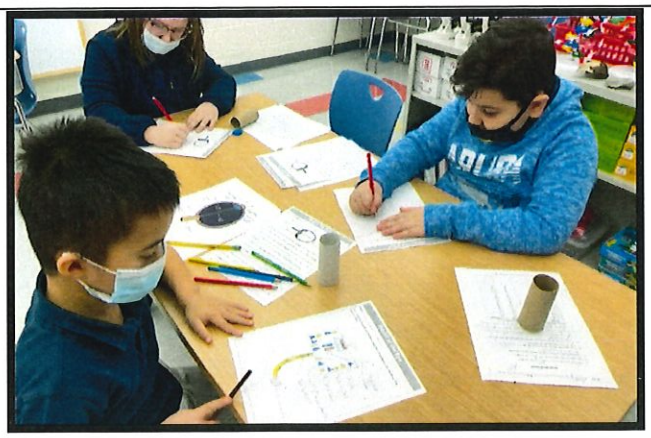
We have advanced our study to foundations of Agriculture & Green Biotechnology. In recent decades, certain crop improvements have resulted from modern biotechnology when targeted changes to a plant's genetic makeup give the plant a new desirable trait. The purpose of this lesson was to introduce students to apple growing and show them how selective breeding is used to benefit both the apple grower and consumer by producing a new and better-quality apple. Students learned more about an apple that was developed through selective breeding from two different parent apple varieties. The basic techniques of apple-growing haven't changed much over the years; however, some new technologies, such as using DNA analysis in choosing parents and seedlings, are providing some important new tools in apple propagation. Grafting involves inserting a bud or twig from one plant into a small cut in the bark of a rootstock, which is a compatible trunk with established roots. The students had a chance to experiment with combining two apples of their choice based on selected desired traits to create a new breed of apple and give it a name. They then created a model of their new breed of apple. They are also working on an advertisement for their new apple to introduce it to the world.



Plastic comes in all forms, shapes, sizes etc. and is used for just about everything! Today Group 2 students learned how to create Bioplastics! This is plastic derived from **renewable sources** that can be completely broken down and returned to the earth. Why Bioplastic? There are many types of plastic used in our everyday life. The source, type and chemical composition of plastic determines the size of its carbon footprint (total amount of greenhouse gasses produced in its manufacture, use and breakdown). Bioplastics are considered carbon neutral because the plants grown to make the plastic remove as much carbon dioxide from the atmosphere as is put into it during manufacturing process. The majority of plastic used today comes from nonrenewable oil. Some types of plastic are hydro-degradable (broken down by water) or photodegradable (broken down by sunlight). However, most plastic ends up in landfills and stays there indefinitely because it is not biodegradable (broken down by bacteria and fungi). One of the great challenges of the modern era is to develop inexpensive, durable and biodegradable plastic made from renewable sources.

Starches (corn, rice, potato, tapioca, cassava, beets, etc.) are widely available natural resources, they have become a common alternative to petrochemical plastics. Collectively, these alternative plastics are referred to as **bioplastics**. Over the last 20 years, many inexpensive bioplastic alternatives have been developed and used in common household products such as food packaging, disposable tableware, and compostable bags.

The students created their own bioplastic using the engineering design process.



Andrew Skirpan, Andy Ciftja & Emilia Czarnecki from School 4, Grade 3, studying Biomedical Devices for Eyes.

Our eyes are an important part of our nervous system. What do we do with our eyes? We see the world around us! Why do we have two eyes? Well, two eyes help us see a larger area than just one eye. Each of our eyes sees an object from slightly different angles, enabling our brains to fit two images together to make 3-D images in our heads. Does everybody see the same? Well, everyone's eyes have lenses that change shape when we focus on something. Biomedical engineers tackle some of the most difficult challenges, such as correcting and rebuilding non-functioning body parts. The biomedical devices that engineers create directly impact and help people. This includes prescription glasses and contact lenses, the equipment, and tools to test your vision, as well as the microkeratome and excimer lasers used in LASIK eye surgery. Because of these modern engineering marvels, people who previously could not see clearly are now able to see perfectly. And, with some innovative engineering devices, people who could not see at all are able to see shapes and images.
The students measured their own eyesight and calculated the average eyesight value for the class. They learned about technologies to enhance eyesight and how engineers play an important role in the development of these technologies. They were able to examine the structure and function of the human eye, learning some amazing features about our eyes, which provide us with sight and an understanding of our surroundings. They also associated the parts of the eye and their function with everyday items. For example, the optic nerve is like an electrical cord that leads to the brain, and they would draw an electric cord with a plug-in place of the optic nerve and so on. The students also learned about some common eye problems and the biomedical devices and medical procedures that resolve or help to lessen the effects of these vision deficiencies, including vision correction surgery. They also got to explore the engineering design process through the associated activity to help correct the vision of others in our classroom with a display board.

Bioremediation is the process of using live microorganisms (mostly bacteria) to remediate or clean up pollution, such as manmade chemicals found in oil. Biodegradation is the process of living organisms breaking down matter for energy. What is the difference between bioremediation and biodegradation? Engineering! While biodegradation happens naturally, engineers involved in bioremediation create products that help nature do its job of getting rid of pollutants. Often, biodegradation does not take place naturally because the bacteria present do not have one of the essential needs of living things (i.e., energy, water, living space and homeostasis). Engineers come to the rescue by providing these needs.
In this lesson, the students acted as environmental engineers involved with the clean-up of a toxic spill. Using bioremediation as the process, students selected which bacteria they will use to eat up the pollutant spilled. Students learned how engineers use bioremediation to make organisms degrade harmful chemicals. Engineers must make sure bacteria have everything they need to live and degrade contaminants for bioremediation to happen. The students learned about the needs of living things by setting up an experiment with yeast. Luckily, there are organisms that can help "eat up" the oil and turn it into harmless substances. Following the important design step of gathering information, they conducted an experiment to see how you can create the right living conditions to make these organisms thrive. The scientific method was reinforced as the students designed the experiment themselves making sure they included a control and completed parts of a formal lab report. They used sugar to represent the oil, and yeast to represent the organisms that clean up oil by eating it.

Jeronimo Ospina & Brayden Rodriguez, Grade 5, Schools #6 & 8 creating a model of their cultivated apple creation.

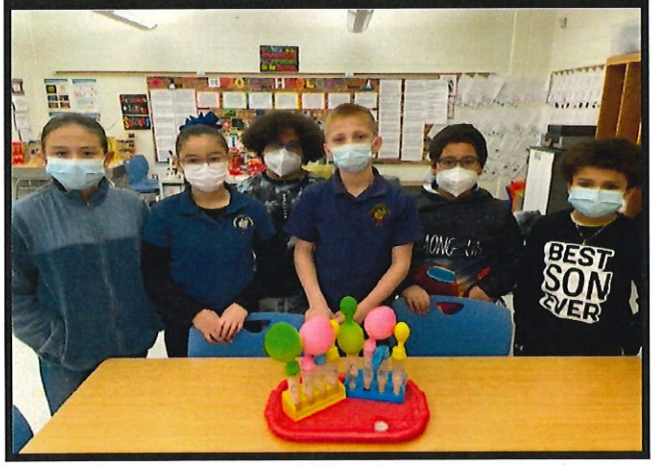
Christopher Frullo & Luis Lantigua, Grade 5, Schools 5 & 4, using coding Robots and instruments.

Emilia Walczyk, Luis Lantigua & Vincent Jiminian, Grade 5, School 4 creating a model of the human eye.

Cloe Ramirez, Grade 4, School 6, examining plant cells under a microscope. Cloe and Jan Swietkowski, Grade 4, School 10 constructing a structure to play a game.

Groups 2 & 3, Schools 5, 8, 9 & 10 conducting a microorganism experiment for Bioremediation.

Groups 1 & 7, Schools 7 & 10 creating environmentally friendly biodegradable Bioplastics during an experiment.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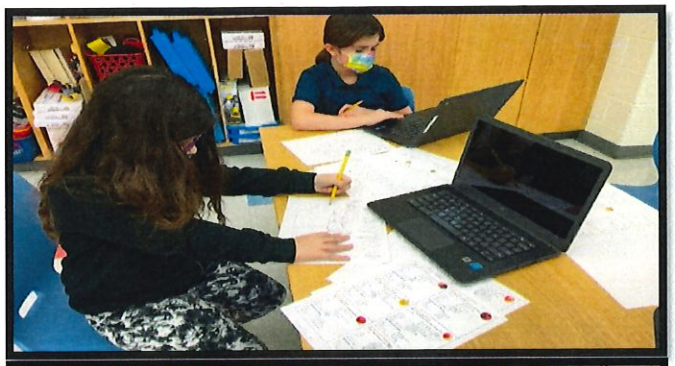
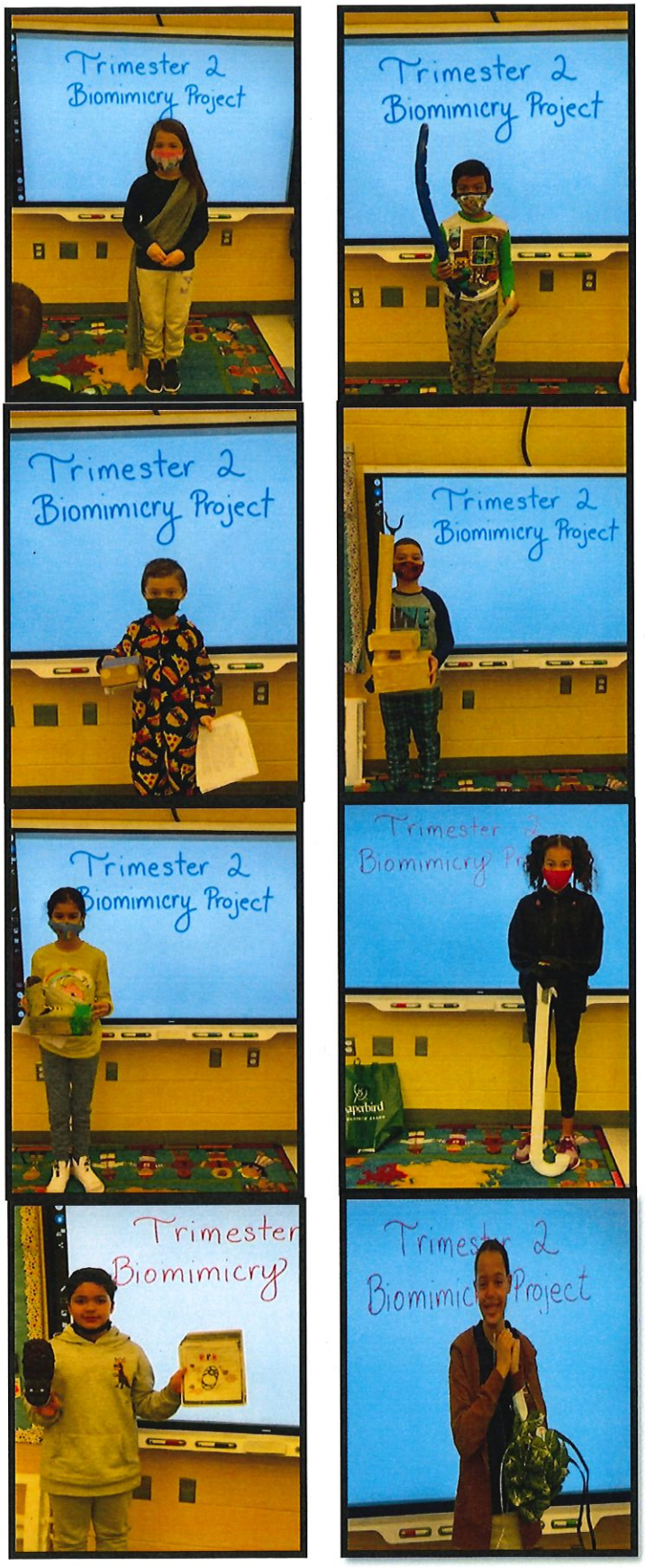
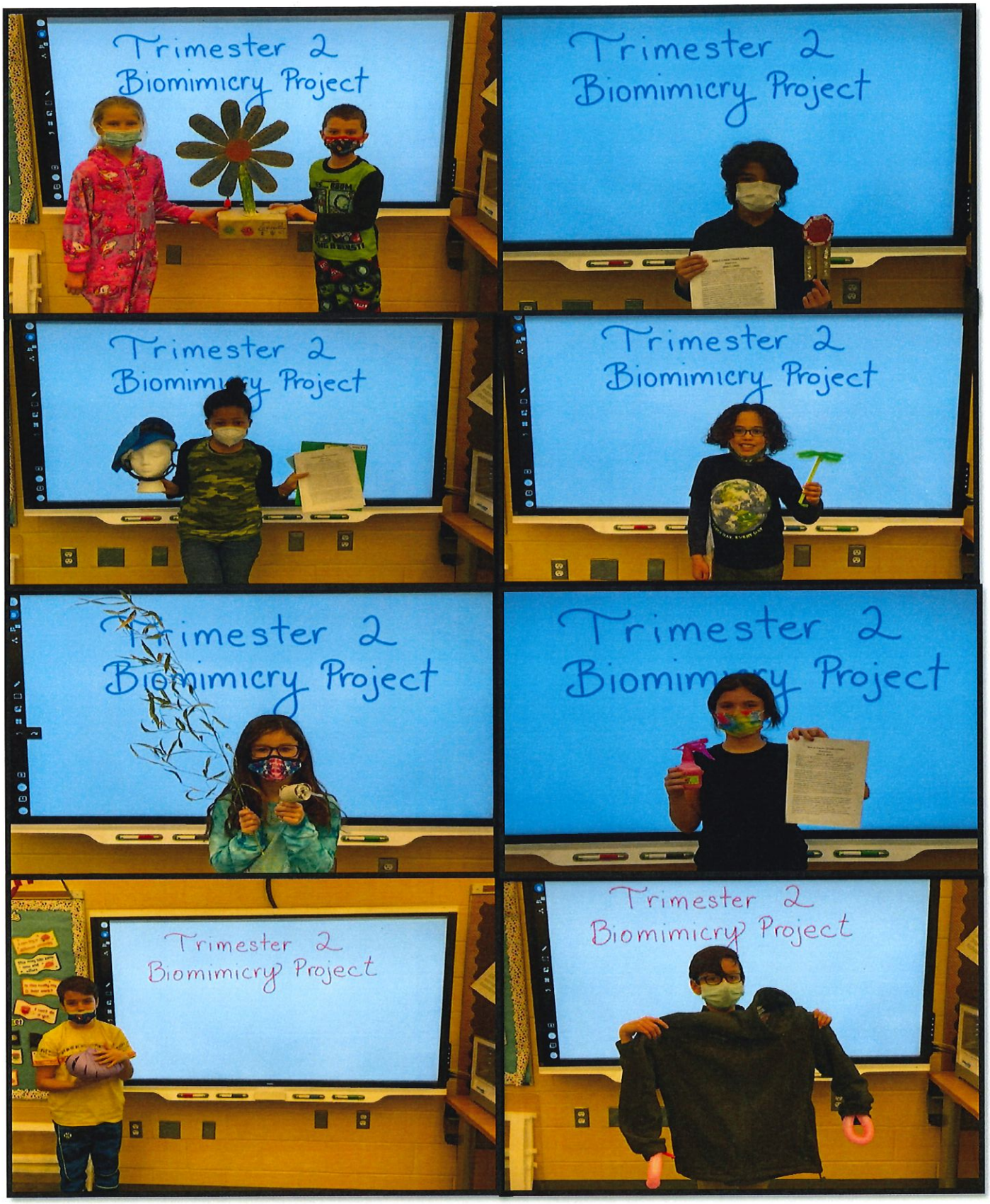


We are Engineers!

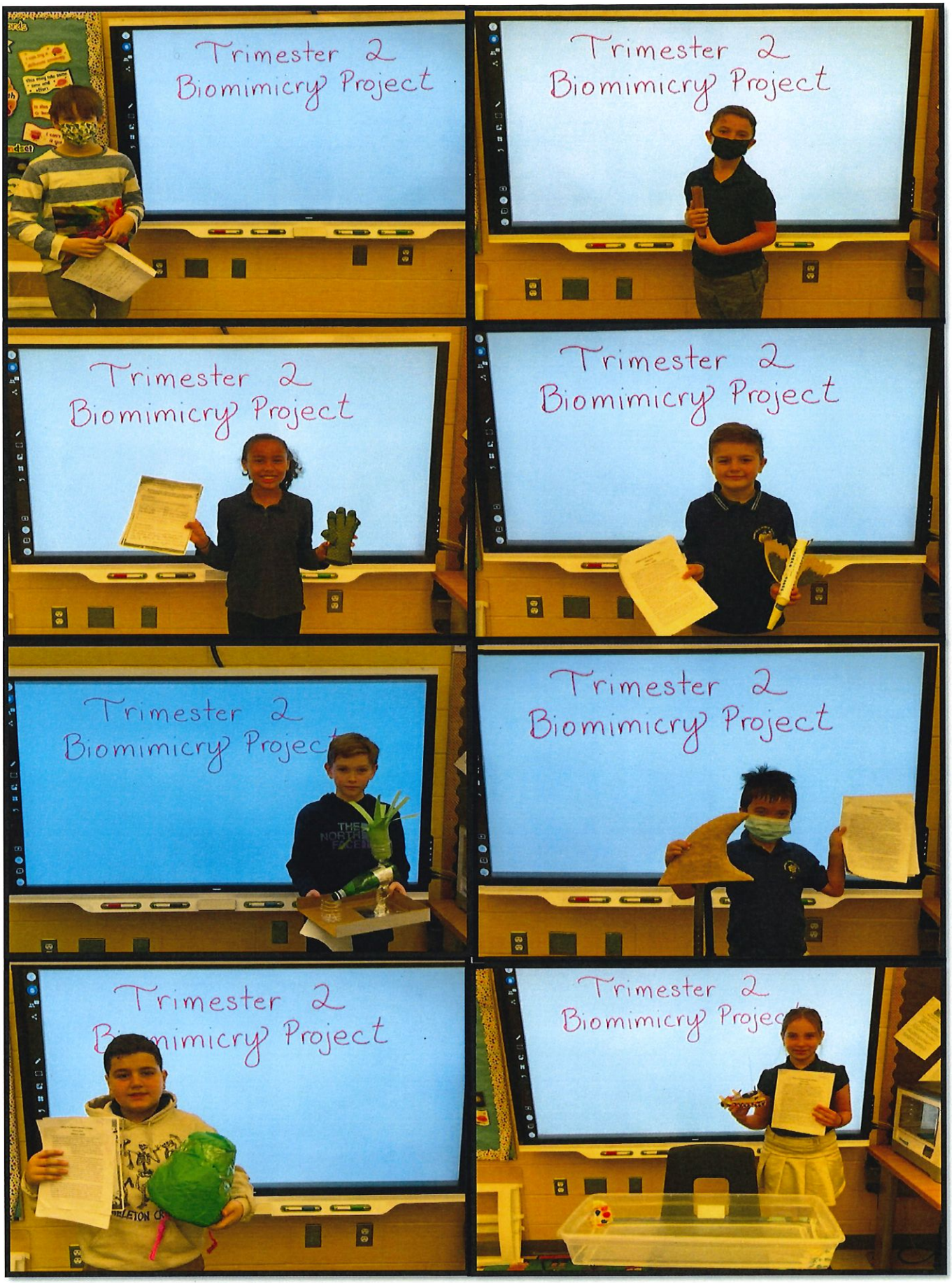
Our second trimester home project was about Biomimicry. What does the word "biomimicry" mean? "Bio" means life and "mimicry" means to imitate. So, biomimicry means to imitate life or nature. Who has heard the expression, "Nature knows best?" Well, biomimicry is a way of learning from nature. It is a way to observe nature in action and use that knowledge to inspire new ideas. Engineers often use these ideas to develop cool new products or better ways to do things to help people. The students will learn all about biomimicry and how engineers look at the amazing characteristics of animals and plants to create new or improved product designs. Engineers demonstrate their knowledge of biomimicry by practicing brainstorming and designing a new product based on what they know about animals and nature. Biomimicry involves solving human problems by mimicking natural solutions. The students learned about a few fun examples of the many creative and useful instances of biomimicry followed by then utilizing their engineering skills to prototype applications and products from the associated activity. Engineers often use the natural world as inspiration for design. Biologically inspired designs include air- and sea-going vessels, navigation tools such as sonar and radar, medical imaging devices, biomedical technologies like prosthetics, and water and pollution treatment processes. Biomimicry has resulted in many creative products, such as materials inspired by the slick leaves of the lotus plant and its natural capacity to wash away dirt particles with every rainfall, and the Velcro hook-and-loop system inspired by the prickly plant burrs that stick to our clothes. Plants and animals are truly nature's engineers. For example, a simple leaf can harness solar energy more efficiently than our best solar panels. Over millions of years, plants and animals have developed ingenious ways to survive on Earth. As engineers, we can consult nature to improve upon our existing designs and products. By studying nature, we can also gain inspiration for designs that have never before existed. Engineers design products that are essential to our health, happiness and safety. To meet these human needs, engineers often look to nature's examples of efficient design solutions. The natural world provides a myriad of creative solutions that can inspire effective and elegant design ideas.

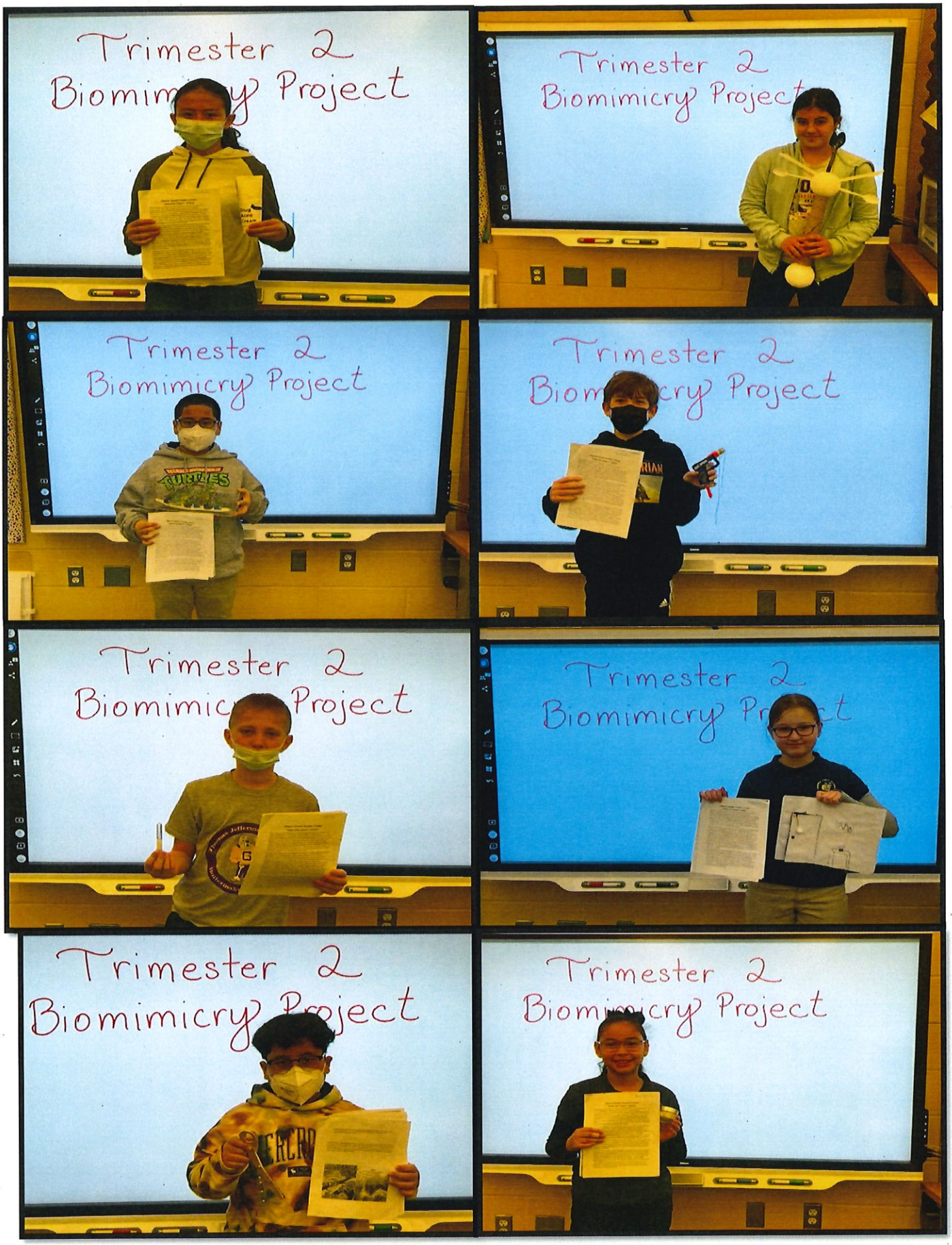


"If you can dream it, you can do it. Always remember that this whole thing was started with a dream and a mouse." – Walt Disney

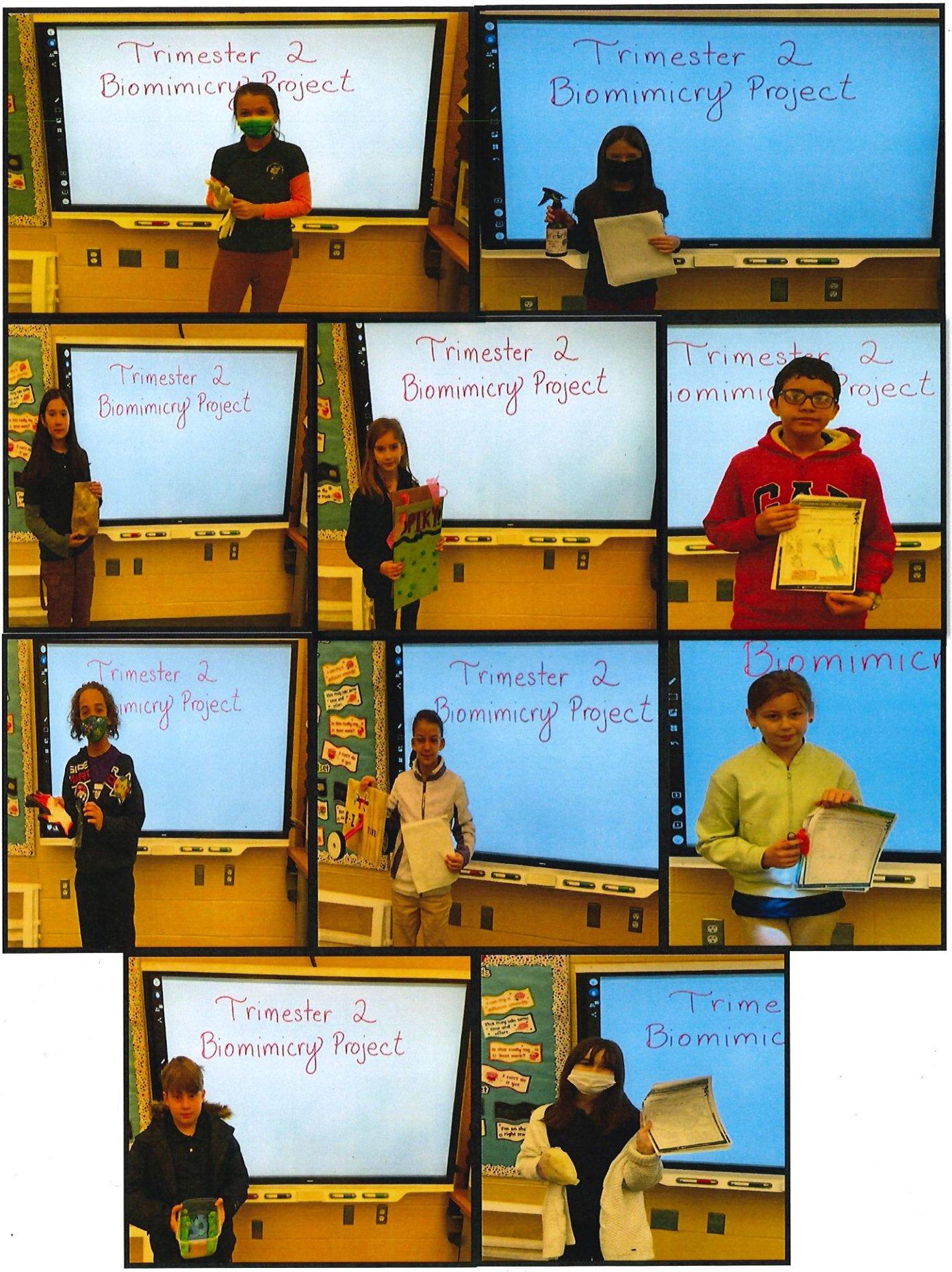


**"Hide not your talents. They for use were made.
What's a sundial in the shade?" – Benjamin Franklin**


Trimester 2
Biomimicry Project



Creativity is intelligence having fun." – Albert Einstein



"Shoot for the moon. Even if you miss it, you will land among the stars." – Les Brown

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