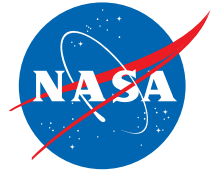


Educational Product	
Educators and Students	Grades K-4
NP-2021-01-001-JSC	

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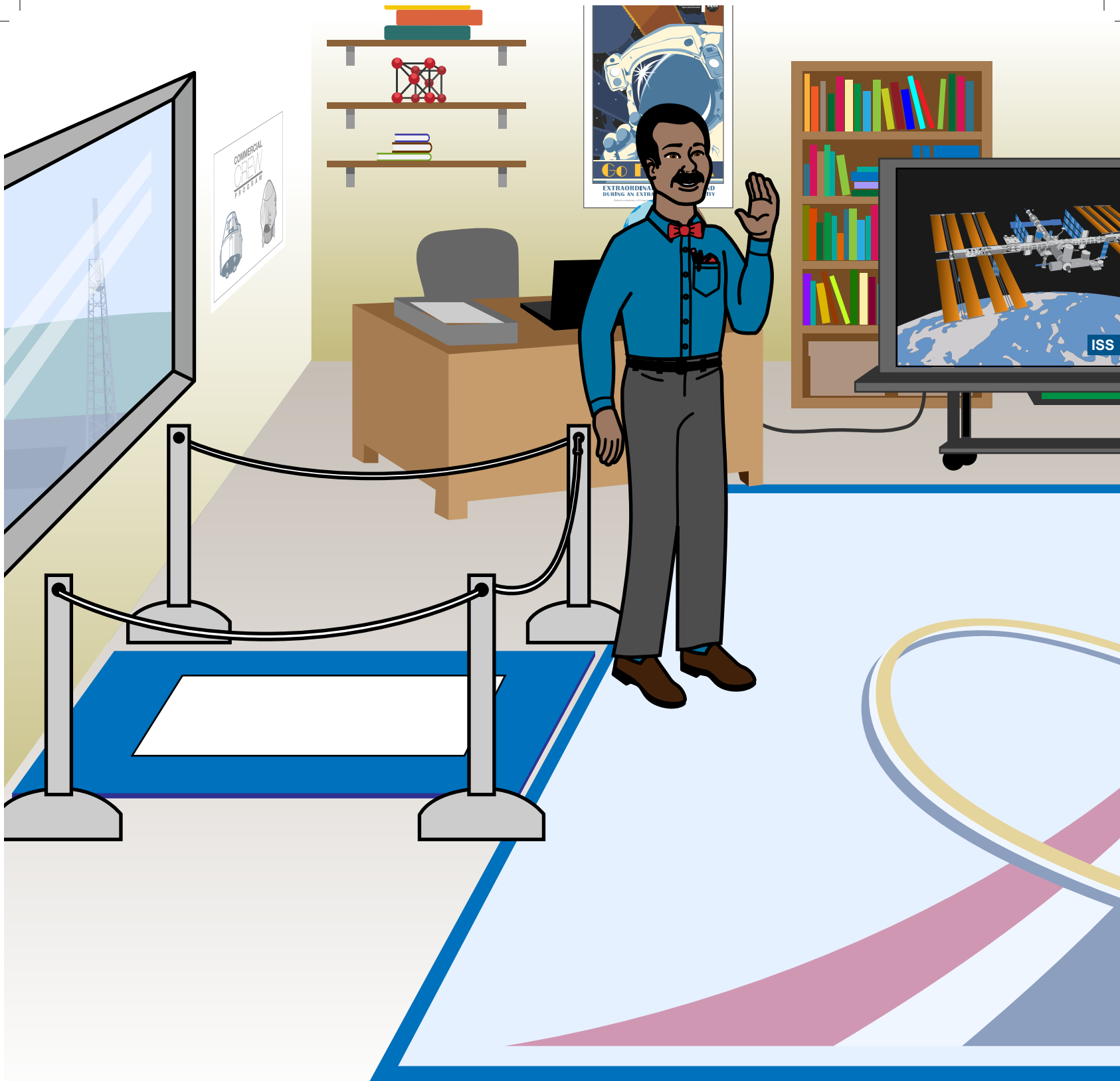


THE **ASTRO-NOT-YETS** ***EXPLORE*** **ENERGY**

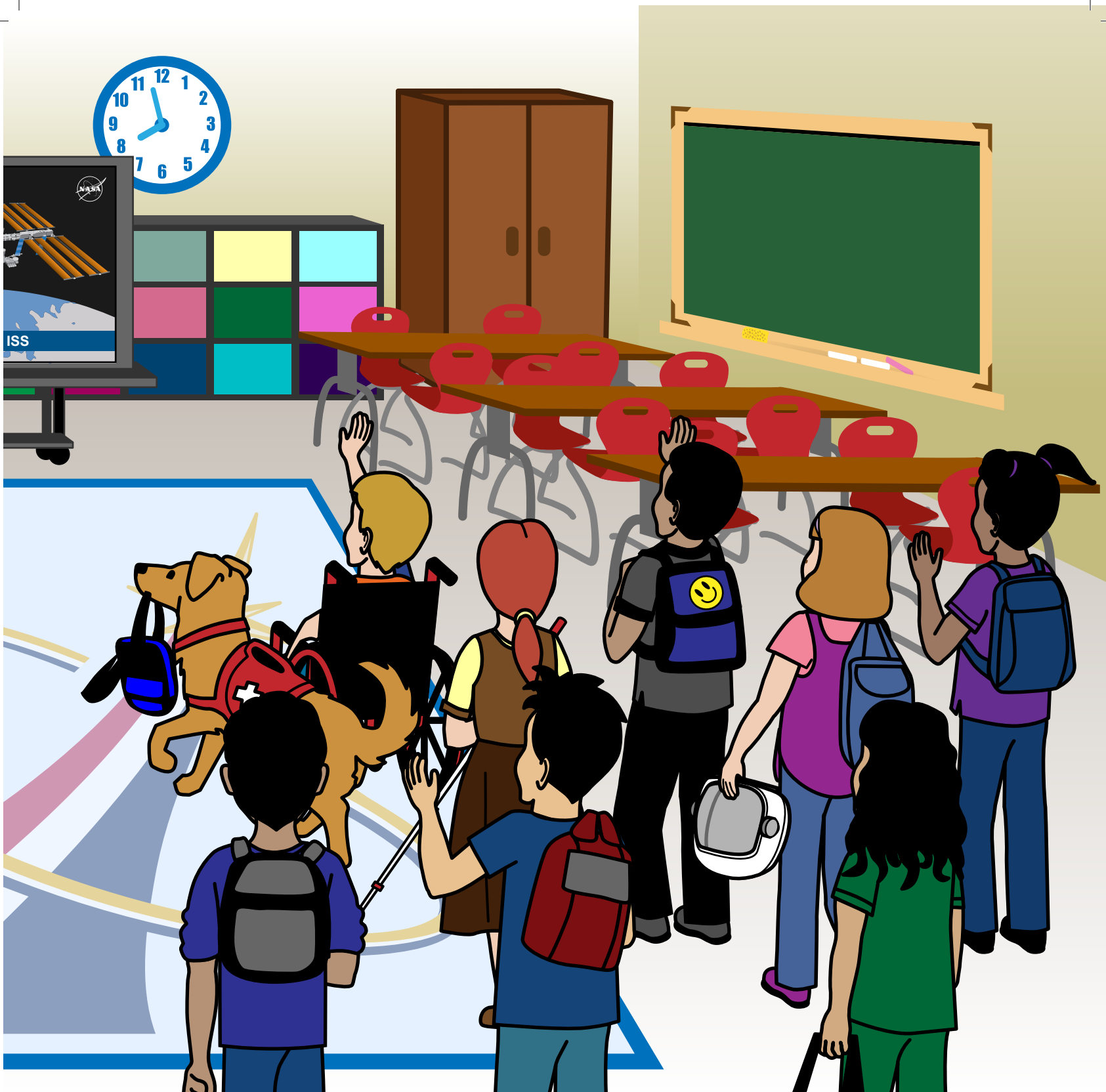


THE
ASTRO-NOT-YETS
EXPLORE
ENERGY

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Illustrator: Cindy Bush
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On the Space Coast of the United States, students eager to learn more about the world and space around them began another school day with their teacher, Mr. Armstrong. These students, known as the Astro-Not-Yets, were ready to explore the next thrilling topic on their journey to becoming NASA's future astronauts.

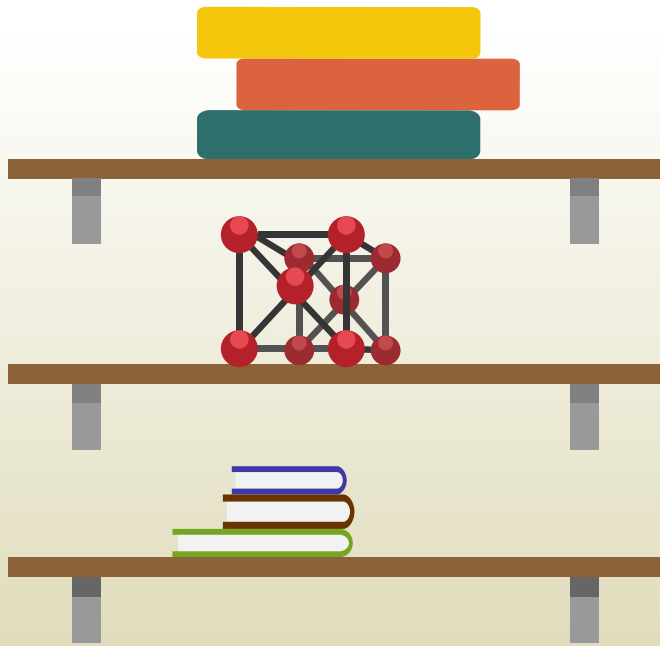


The students gathered on the carpet while Mr. Armstrong told them about an exciting new event to watch on NASA TV. The four astronauts who traveled to the International Space Station months ago would be making their way back home!



Stella asked, “If they have to launch from the ground to get to the space station, how do they plan to get home?”

Mr. Armstrong looked at the class and stated, “That’s a great question, Stella. Does anyone have any ideas for how astronauts might come back down to Earth from 250 miles above the surface?”



Leo raised his hand and said, “I bet they land like an airplane on a runway!”

Several of the students nodded in agreement. Mr. Armstrong pointed to a poster of the new spacecraft in which the astronauts were traveling and said, “That is a great guess, Leo! When astronauts flew on the Space Shuttle, they did land a lot like an airplane. Now that astronauts travel in these new spacecraft, they use a different method.”

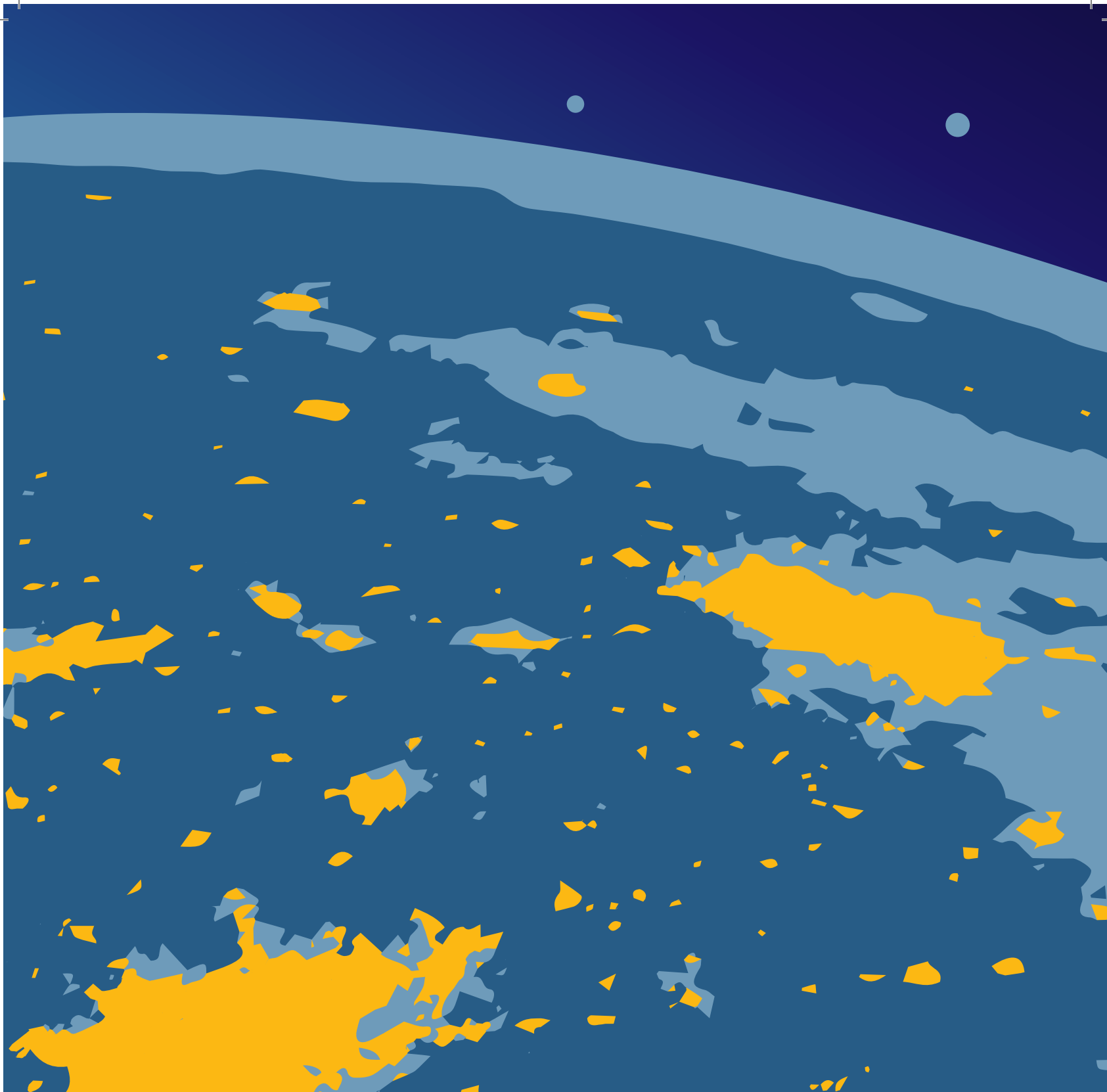


Aurora raised her hand and exclaimed, “I bet we could all come up with an idea of what they use to help them land!”

Mr. Armstrong smiled. “I bet you are right, Aurora. You all are great engineers and always come up with creative solutions to different problems.”



With NASA TV on in the background — and with the announcer counting down to the landing, one hour away — the Astro-Not-Yets looked to Mr. Armstrong, hoping he would announce an engineering design challenge.



To the students' delight, Mr. Armstrong explained, "Alright Astro-Not-Yets, what do you say we figure out a drop test challenge today while we wait for the landing?" The students cheered and returned to their tables where they awaited details on the challenge.

Mr. Armstrong looked at the anxious students and asked, "Does anyone know why we would need something to help with landing? Why can't the astronauts simply fall back to Earth?"



Orion responded, “If they fell, they would be going way too fast to land safely.”

“Exactly,” Mr. Armstrong said. “When astronauts travel back through the Earth’s atmosphere to return home, they are slowing down from almost 17,500 miles per hour! When your parents drive you to school, they are going around 25 miles per hour, so the astronauts are flying extremely fast! Since their spacecraft is traveling at a high speed, the energy is also very high. To land safely, they will need to slow down the spacecraft so that the energy is not very high when it reaches the surface.”



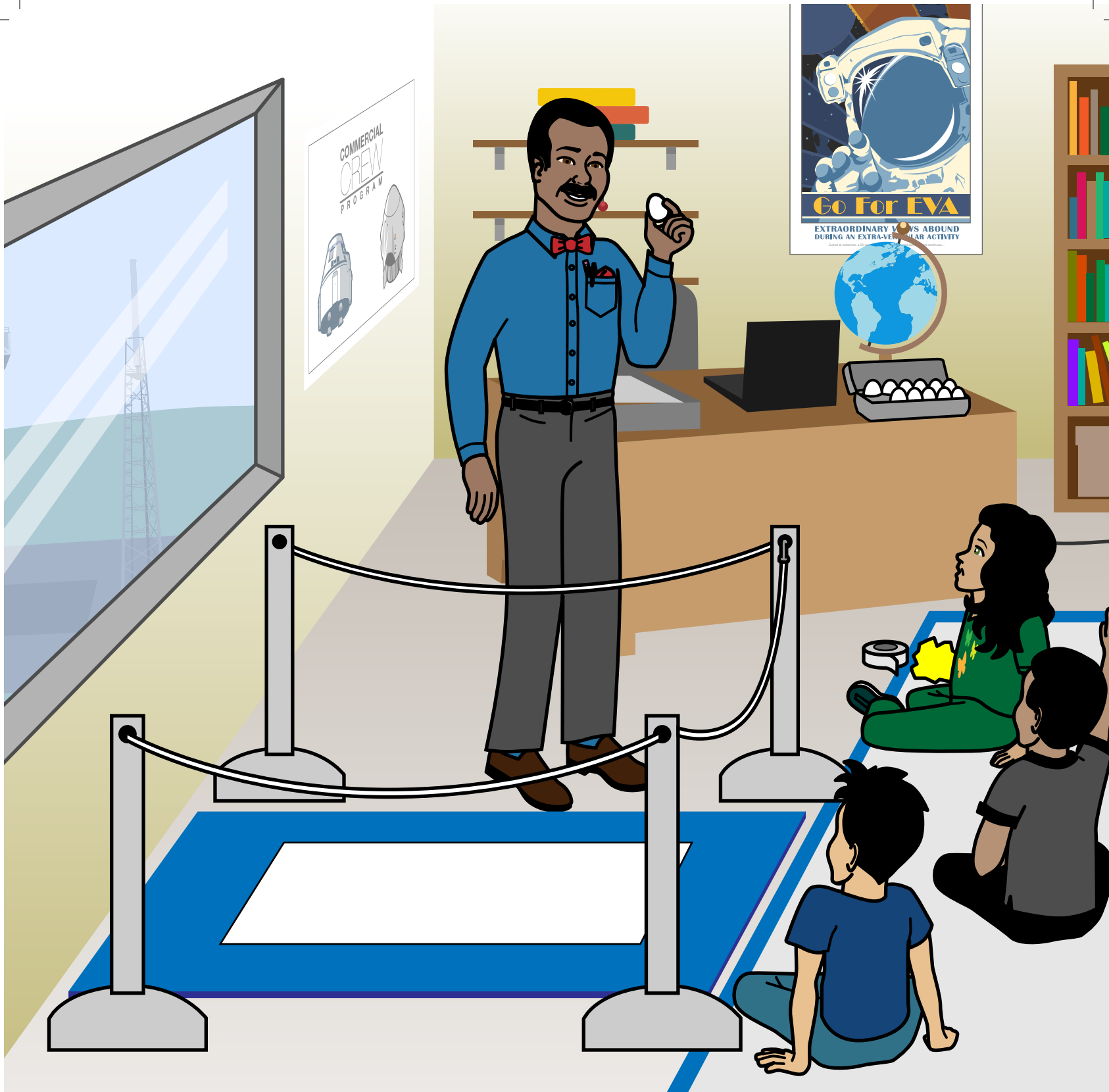
Mrs. Armstrong continued. “Today, you all are going to design and build a landing system to safely land an egg!”

The Astro-Not-Yets could barely contain their excitement but kept listening as Mr. Armstrong explained. “You may use any combination of items in the makerspace to try and decrease the energy of your egg before it hits the ground.”

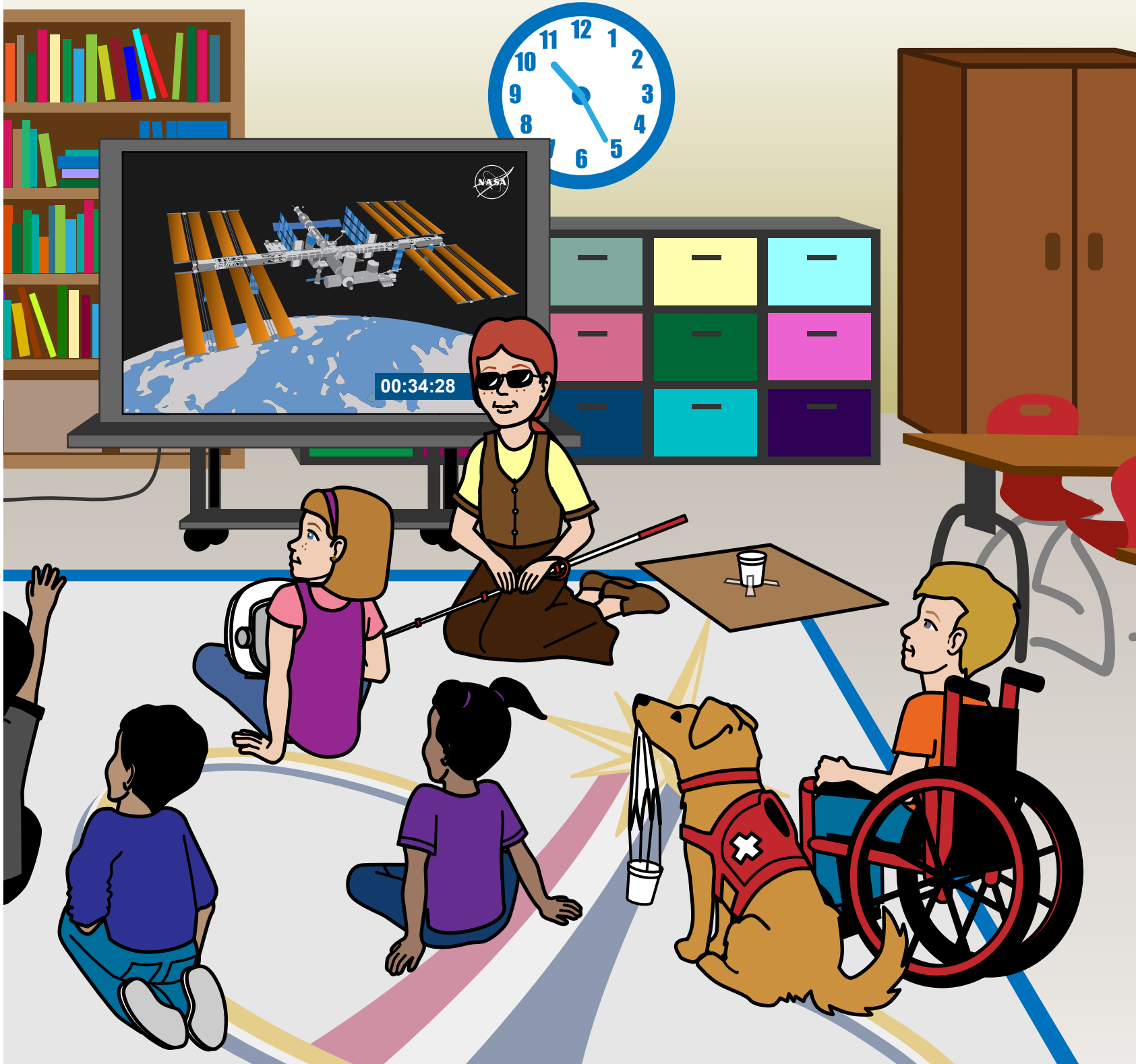


Using a practice egg, Mr. Armstrong demonstrated what happens once the egg hits the ground. When he dropped it from a height just above his head into the drop zone, the egg cracked on the floor mat.

After the demonstration, students brainstormed the landing system they believed would safely land their own egg. The groups then collected items from the classroom makerspace to begin building their designs.



When the groups completed the construction of their landing systems, Mr. Armstrong asked them to gather on the classroom carpet to go over safety for the drop zone. Before walking students back to the zone, Mr. Armstrong asked, “If we aren’t successful at landing the egg without cracking it, what do we do?”



Leo quickly responded. “Make changes, and try again!”

Aurora also chimed in. “And if you try again and it doesn’t work, you make more changes!”

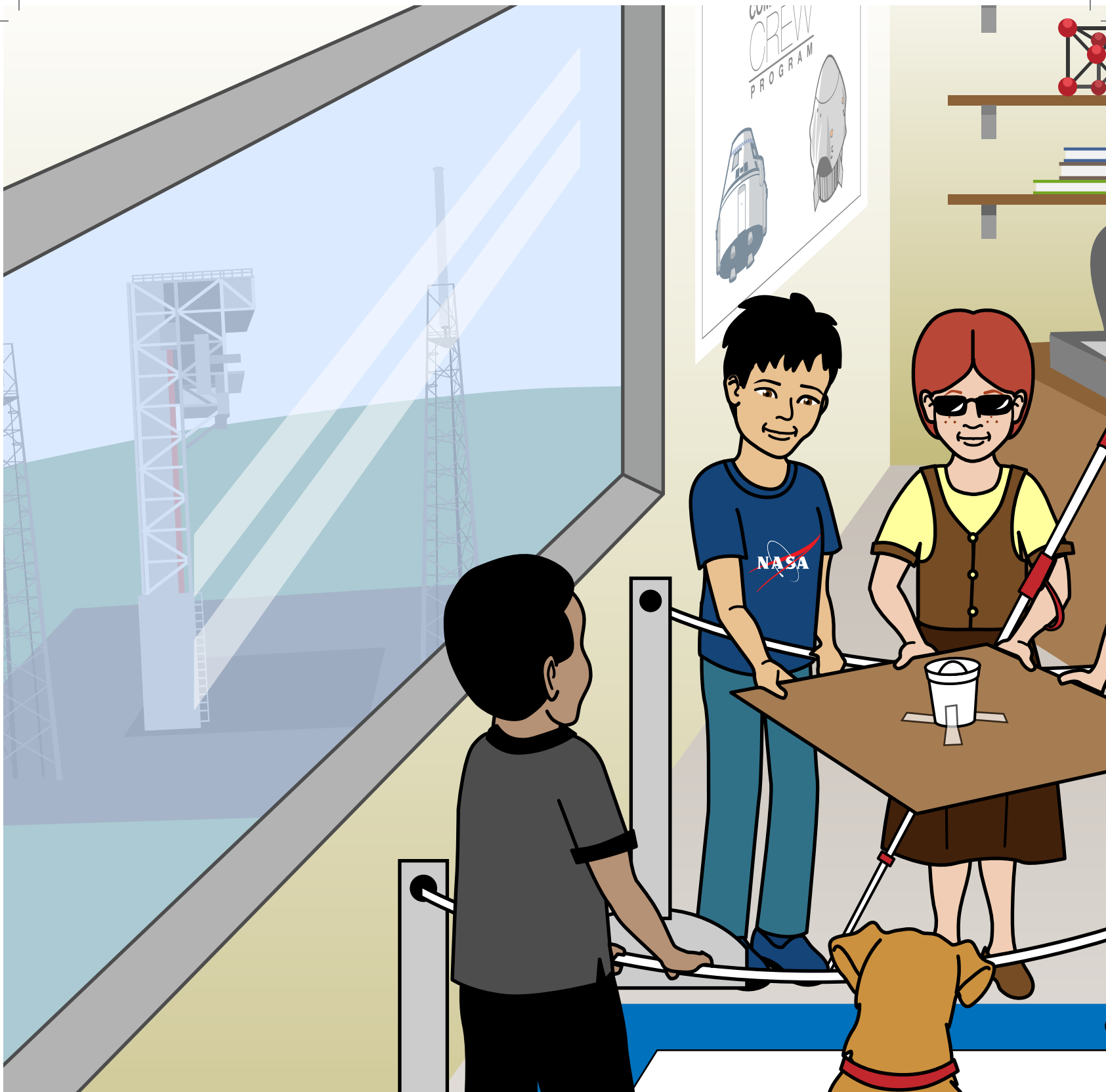
The Astro-Not-Yets nodded in agreement, knowing that Mr. Armstrong always liked to talk about the importance of improving their designs and never giving up.



Proud of the Astro-Not-Yets' willingness to test their designs, Mr. Armstrong gathered the students around the roped-off drop zone. Aurora's group volunteered first with a design that included a cushion of tissue paper bundled on the bottom of the egg.



All of the students counted down together “3...2...1...” before Aurora released her group’s egg into the zone. The egg fell quickly to the ground, landing on its side instead of on the cushion. A loud cracking noise followed, and the egg yolk splashed across the drop zone mat.



Mr. Armstrong lifted what was left of the egg and quickly replaced the mat. “We didn’t have a successful landing with this one, but that’s what testing is all about. Aurora, how about you and your team redesign and meet us back here at the drop zone?”

Although disappointed in their first test, Aurora’s group was ready to take on the challenge and quickly returned to the makerspace.



Leo and Stella's group volunteered next. Their design included one big piece of cardboard underneath a cup with the egg nestled inside. Their design moved more slowly to the ground than the previous design.

Mr. Armstrong picked up the cup and examined the egg, announcing, "We have our first success!"

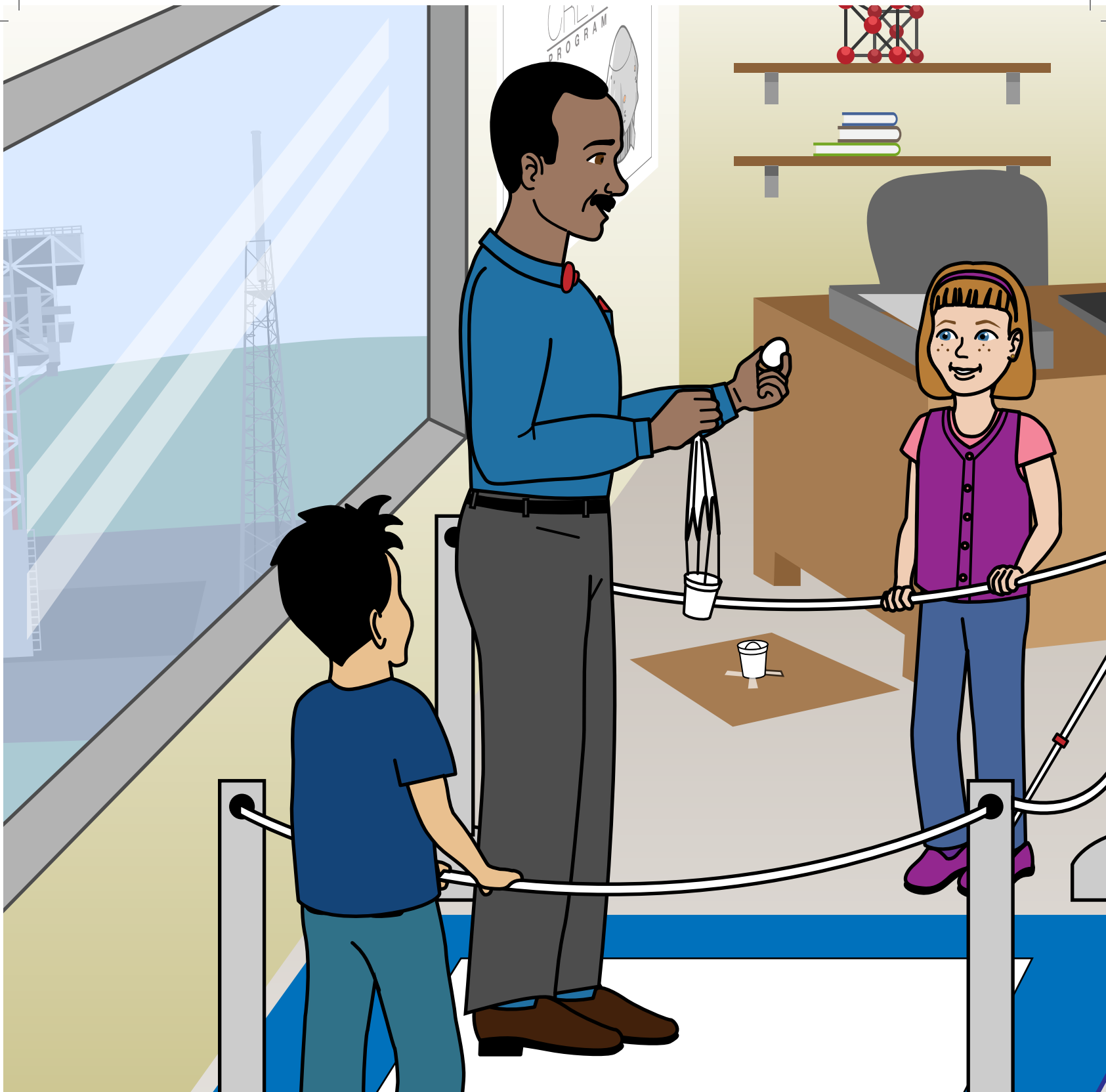


Orion's group was last to drop their egg. They showed the class their design, which had a canopy of plastic material tied with string to a cup with the egg inside.

Go For EVA
EXTRAORDINARY VOYS ABOUND
DURING AN EXTRA-VEHICULAR ACTIVITY
Subject to extremes, a 10-minute activity continues...



The entire class gathered around the drop zone to watch the outcome. To their surprise, the egg slowly glided down and landed softly on the ground without any cracking sound or spilled yolk!



After picking up the last group's egg, Mr. Armstrong said, "This is an impressive design, and was also a success! I am happy to see that your group was thinking outside of the box with a parachute design."

Go For EVA
EXTRAORDINARY VOYS AROUND
DURING AN EXTRA-VEHICULAR ACTIVITY
Submitted to addresses: a 90-year-old woman who continues...



After revisiting the makerspace, Aurora's group was ready to attempt their egg drop again. Aurora announced to the class, "We thought about how our first try didn't slow down the speed of the egg, so it hit the ground with a lot of energy. Especially since it didn't land on our cushion!"



Aurora revealed their new design, which included both a parachute system and a tissue paper cushion on the bottom. After the students counted down, the egg glided slowly to the ground and had a soft landing on top of the cushion.

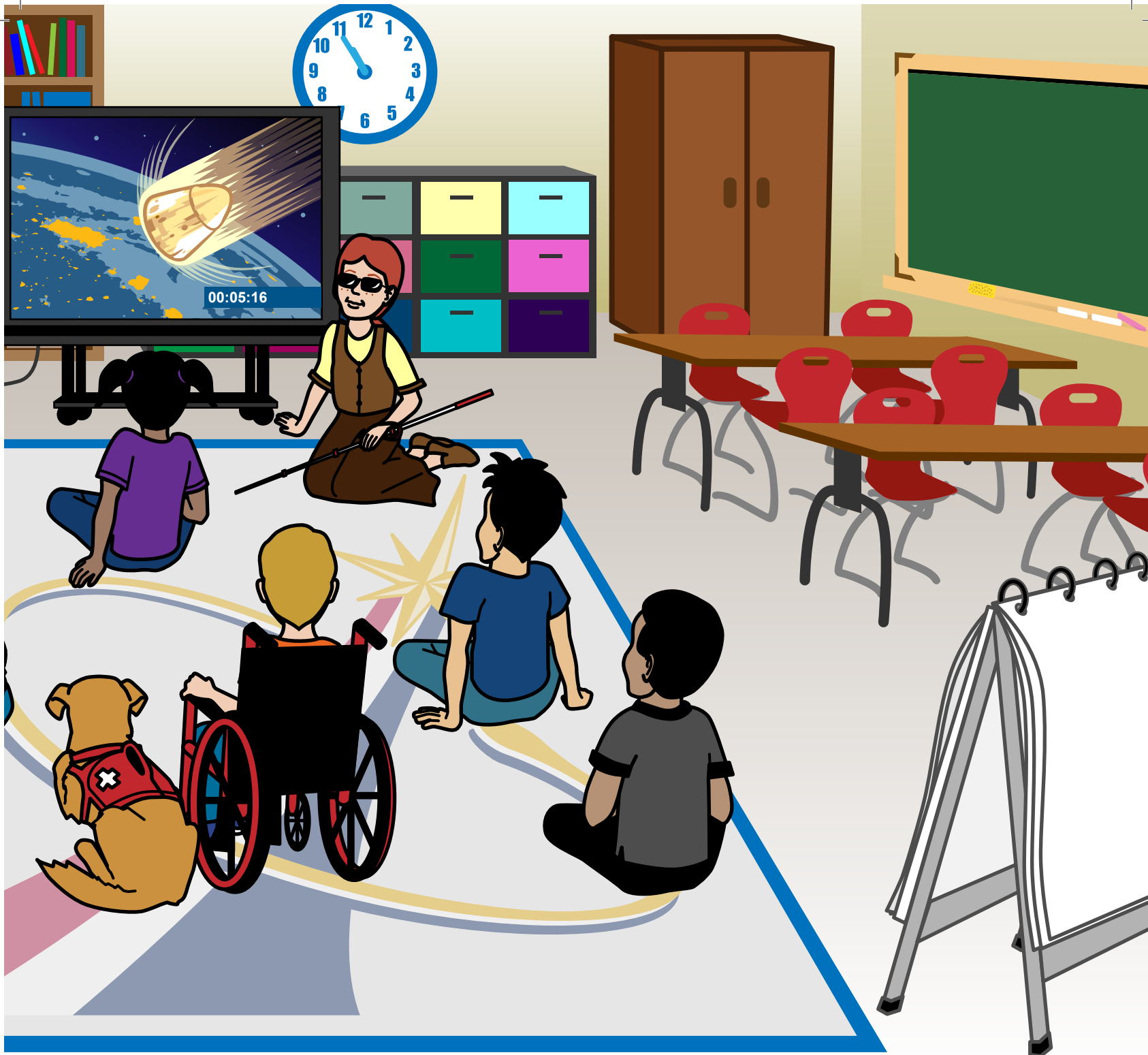


After everyone regrouped on the carpet, Mr. Armstrong revisited the statement that Orion had made earlier. “If we think about the new spacecraft traveling back to Earth at a fast speed with a ton of energy, how might NASA decrease the energy of the spacecraft before it reaches the Earth’s surface?”

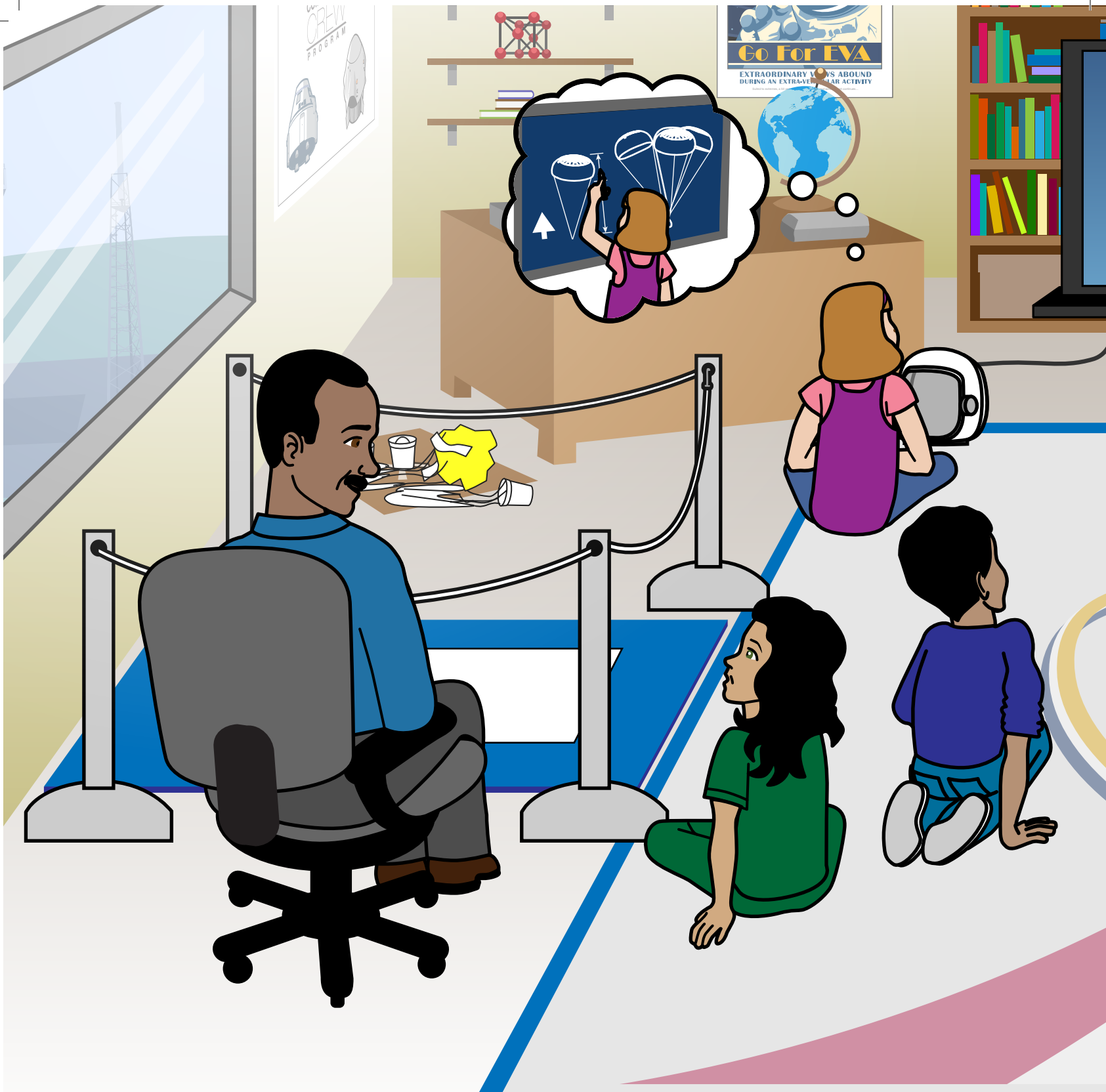


Aurora raised her hand and exclaimed, “Parachutes!”

Mr. Armstrong smiled. “That is correct, Aurora. These new spacecraft use parachutes to land either on the ground or in the water. A series of parachutes help to slow down the high speed and energy of the spacecraft once it gets closer to the Earth’s surface. The Space Shuttle also used parachutes in the back to help slow the speed of the shuttle, even though it landed like an airplane.”



Stella spoke up. “In our last design challenge, we saw how the two different spacecraft were both successful. Today, we showed that all of our different egg drop designs could be successful, too. We kept our egg astronauts, or Eggstronauts, safe! Just like NASA keeps their astronauts safe!”



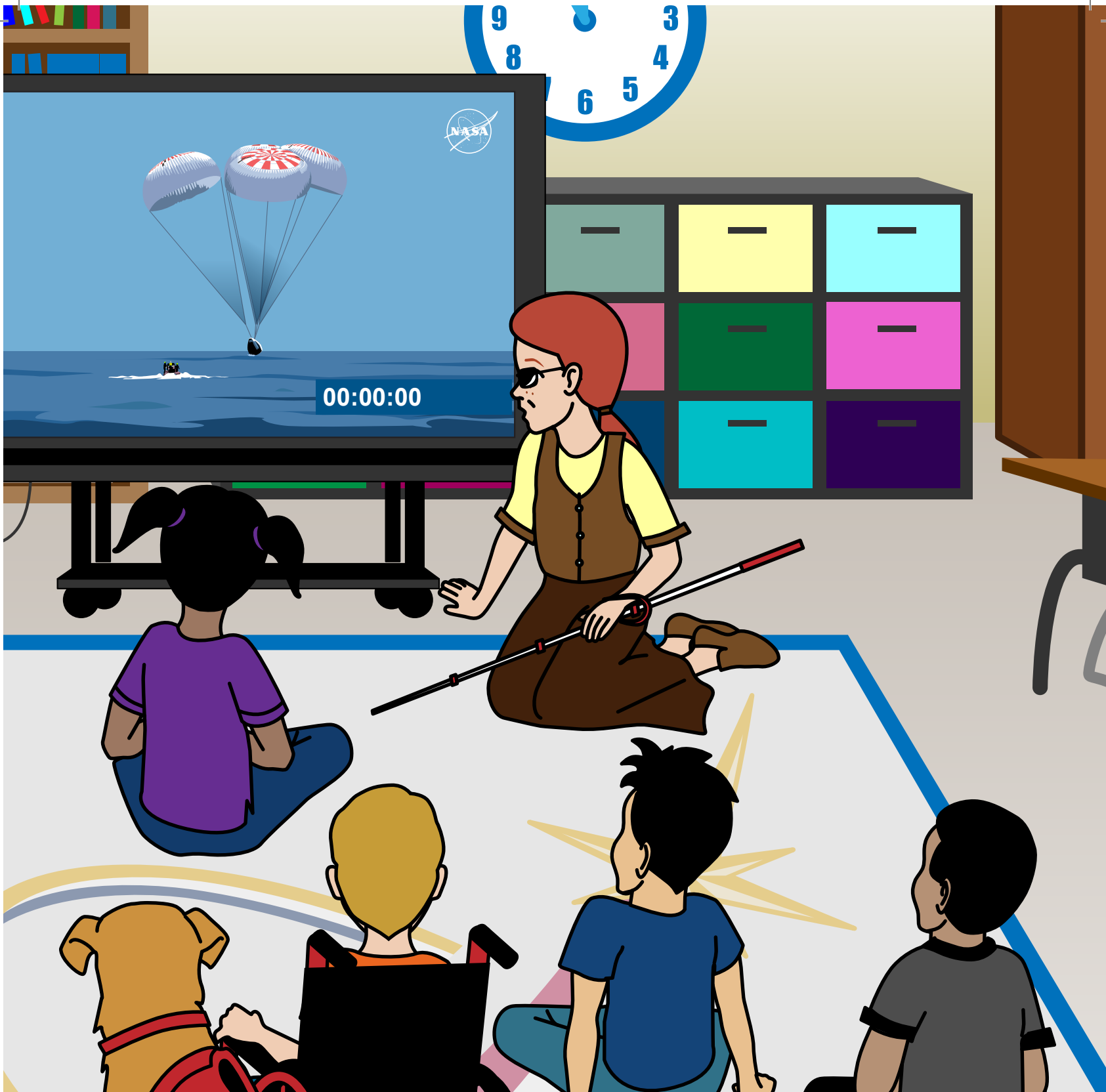
The students watched the screen in excitement, waiting to see what the parachutes will look like once they release from the spacecraft. Aurora asked Mr. Armstrong, “Do you think the Astro-Not-Yets could also help work on parachutes or landing designs one day, when we grow up?”



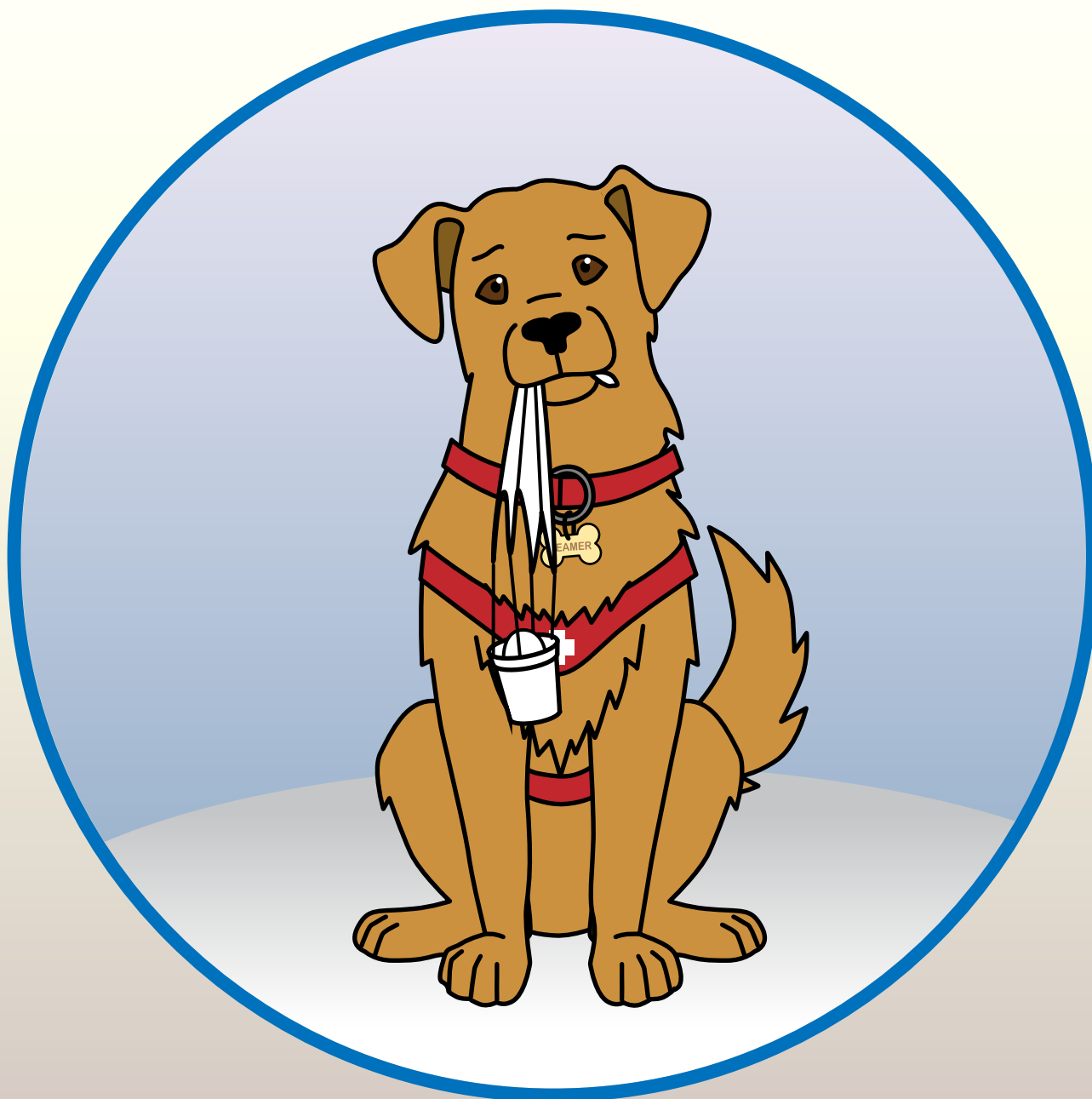
Mr. Armstrong responded, “Absolutely, Aurora! Although you are all the Astro-Not-Yets, many other people work at NASA alongside the astronauts to help with the success of space travel. A parachute engineer would be a very exciting and rewarding job!”



The NASA broadcaster announced the opening of the first group of parachutes for the spacecraft. The class watched in amazement as the parachutes ballooned in the air. To the students' surprise, another set of four parachutes released from the spacecraft.



The students cheered as a design similar to their own slowly drifted down and splashed into the ocean. Once again, the Astro-Not-Yets watched in wonder as the landing proved that their own work with design challenges could one day help improve space travel. In fact, they couldn't wait until their next classroom design challenge!



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