

# JACOBA'S GLASSES®



A Connector for the electromagnetic spectrum, optics, perspective, and self-reflection

**Keywords:** optics, perspective, self-reflection, short story, 2D and 3D, areas, forces and motion, frustration tolerance.






Grade level for reading: 4, 5, 6, 7, 8

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**Guide:** This provides you with a story connected to lessons, media and activities. While reading the story symbols indicate where you can stop to supplement the story with imagery, lessons or activities. The resources are referenced according to the legend and can be found at the end of the story. A clean version (no symbols) with just the story is available for students.

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## Legend:

Art & Writing Activity	
Connector Story	
Connector Media	
Hands-On Activity	
Easter Egg	

Slobber dripped from Veteris' face and fell to the ground with a splat. Veteris waved his hand at Fidel and tried to push him away. Fidel didn't mind. The dog dodged his swinging hands and kept licking him. Veteris rolled into a ball on the ground. His muffled laughing mixed with yelps from Fidel. The dog ran from Veteris, right at Sufi.

"Ahh," Sufi yelled. She ducked her head. She hid her face under her large strands of dark red and light white hair. The dog sniffed at the back of her head. Sufi felt her hair jump from the hot air out of Fidel's snout.

"Come back over here, you hound!" Veteris said through his laughter. The dog obeyed, bouncing back to his owner. Veteris rubbed Fidel's head. "Now sit down for a minute," he said as he put pressure on Fidel. (🗨️1)

"How can you and Fidel be so happy?" asked Sufi.

Veteris looked at her with eyes magnified through his large rimmed glasses. "What do you mean?"

"What do I mean?" asked Sufi with a little anger. "We're stuck out here in this deserted town. We have no water. Euclid is lost. We have..."



“A new challenge?” suggested Veteris. (🗨️ 2) Sufi’s face showed her suspicion. She closed her eyes in frustration, which made Veteris laugh even more. He walked over and pulled a knife from his pocket. Fidel stood rigid behind him. Veteris crouched and began to draw in the sand. Sufi sat quietly watching as the outline of a girl appeared in the sand.

“Is that supposed to be me?” she asked with disappointment.

“Why? No!” replied Veteris. “That is Jacoba, and she has a story!”

(🖼️ 1, ✎️ 1, △ 2)



Jacoba blinked her eyes. She blinked again and again. The problem wasn't dust or dry eyes. The problem was the world, the one she'd always known. It was gone.

Jacoba hid in the alley, afraid to leave. She huffed, resentful the blinking didn't work. It had been two days, and she couldn't make sense of anything. People's faces used to be colorful. They had many shades and many lines combined. What Jacoba knew as normal. Now all the faces were circular and with a single color. They were big eyed versions of the originals. Once full of color, sound and smell, the streets and scenes were strange and stale. Made of just a few bold colors, they were flat and two dimensional.

A comic, Jacoba always insisted they be called graphic novels. Now, it was the graphic aspect that shook her. She was stuck in one. Everyone's attitudes were graphic and distinct, bold like their colors. (✍️ 2)



Jacoba hadn't been in the alley the entire time. Twice she ventured out of the shadows and into this strange world. The first time, she walked out onto the road happily. She watched people go by, no one noticed her. She thought she found a place where she could be one of those characters. One of the graphic heroes that she loved to read. She felt a power in herself. She was ready to leap high, move fast, and fight evil. Then, the monster flew by and changed everything.

Jacoba cowered in the alley. She could still see the beast in her mind. Its four limbs barely touched the ground. It propelled itself forward, four furry feet at a time. It was so fast that the colors of the animal came off in streaks behind it like streamers on a kite. The streaks lingered in the background, obscuring the buildings and streets behind them. The beast was massive and moved in two shades, purple and gray. It was tethered to some boy, or maybe the boy was tethered to it. The monster pulled him along, swinging him far left and right as it turned. He, too, was a blur, a blur that Jacoba saw a second before he would have hit her. She dove for the sidewalk, curling in a ball. She slammed into a café table. The boy and his darting animal were gone before she could clear the spilt coffee off her torn pants. (✍️ 3)



Jacoba thought the people around her would be afraid of the monster. Maybe they would help her. Instead, the patrons of the café yelled at her. Their speech popped up in bubbles from their heads. Jacoba was shocked. She cringed, trying to apologize. No word bubbles held her words. Instead, word bubbles came from the crowd. They read “Clumsy girl!”, “What’s wrong with her?” and “What a mess!”



Jacoba darted for the closest alley. She stayed there watching the road. She hid in the dark, laying flat on the ground. In this graphic world, Jacoba didn't seem to get dirty. That made her happy, but she was sad to find she did get hungry. It didn't seem right. Even after her scare, hunger pushed Jacoba back onto the streets. Her body was long and lean, not heavy by any means. It moved easily, but it needed something to keep it going. She looked left and right along the streets. She did not want another flying animal to take her head off. She reached the café where a young woman came running up to her. The waitress' long hair was two-toned strands, just yellow and brown. Like the rest of this world, there were no colors that mixed. (👉 1)

*Hamburger. Spaghetti. Ice cream.* Jacoba thought as she opened her mouth to speak. Before any of those words were out, the waitress yelled, “Out of here! You know you’re not allowed here. There’s a shelter to help people like you with no money or place to be. Go on!” She grabbed Jacoba by the arm and shoved her backwards. Jacoba stumbled in reverse. The tricolored café became a blur as she fell onto her back. The woman stood over her with a circular face and a slight arrow for a nose. Her mouth was set, unmoving. The people at the café had eyes that formed wedges.

Jacoba jumped back up. She didn’t try to dust herself off this time. She just ran to her alley. She’d been there ever since. Shadows moved down the wall as another day set. No sun showed itself but somehow there was light. The colors were strong and bold, nothing like the world she kept trying to blink herself back to—a world with soft hues and warm dirt.

She lay in the dark angular shade. Hidden from those sliver eyes and circular faces of the citizens of this world. Jacoba’s every blink was a prayer to get back to the world she used to know. She counted them: 45, 46, 47. She hoped she would fall asleep as she counted. She didn’t. (✍️ 4) Her stomach ached, which was an odd feeling in a graphic world. It was a feeling too strong to ignore. She rose slowly, noiselessly. Her head peered around the corner. Her own hair fell in front of her eyes in strands colored too strongly. Questions like “Why am I here?” and “How did I get to this world?” were ones she’s asked herself over and over again. All those questions had gone silent, now she just wanted food.

This time Jacoba followed the alley. She went behind the café to the large trash cans. She peered into the trash bins. She was not sure what she hoped to find. She thought she might get sick from trash food, but fortunately there were no scents to smell. The trash lid clanged as a voice boomed into her frame of vision. “That’s not a place for you, Antela.”

Jacoba spun to see a giant man. His stomach bulged from underneath his T-shirt. His belly and shirt were the same color white. It was all one color except for a thin black stroke where the shirt began. His huge hands reached out to her. They seemed twice as large as they should be. If she saw him in a graphic novel, she would have laughed. His giant hands were too much, even for his big body. But instead, she was afraid. She couldn’t tell if those hands welcomed or threatened her. His word bubbles snapped into place: “Come in here and help Hands clean. After some work then Hands will give you something to eat.”

The man turned and the bubbles above him burst from the air. Jacoba scratched her head. Hands, of course his name would be Hands. Jacoba stood in silence. The man disappeared into the café’s back door. Jacoba looked around the alley. Three clear and solid tones: gray, white and black. Uncertain, she took a step forward and stopped. The man, Hands, reappeared with a smirk on his face. “You are not that hungry then, Antela?” he said.

“Why do you keep calling me Antela?” Jacoba was startled by the bubble. It popped up around her head. It was the first time she’d spoken out loud in this world. Her first word bubble blocked her left eye. Her words disappeared with a pop that made no sound. Hands, the chef, laughed. “You would think a girl would know her own name. You wish to eat or not?”



Jacoba didn't wait. She dashed inside the back of the café. She felt a little sorry for taking Antela's meal, but not that sorry. Hands pointed with a fat finger at a large pile of dishes in a sink. He swung his finger over at the mop in a bucket. His finger moved again to bags of trash. He did not have a single word bubble. His instructions and orders matched his world, graphic.



Jacoba scrubbed the dishes, mopped the floors, and took out garbage. Everything in the kitchen was either yellow, red, or silver. Single tones and sharp angles, that was all this world was. Jacoba's knees grew weak from hunger. She sought payment for her work. She found Hands standing in the alley. There were slim streams of light from a post. The light came in narrow white strips against the darkness outside, which was a pure black. Hands' bearded face smiled a hidden smile as his word bubble popped up. "Ah, is it time to eat? Come with me." ( ✍ 5 )



They sat at a table in the dark alley. Hands's table had a red and white checkered tablecloth. Jacoba ate as furiously and fast as she could. After she couldn't fit another bite, she looked at Hands. "Where am I? This isn't my world and Antela isn't my name! I don't know why I'm here and it all seems too much for me. You're the only one that has been nice to me. Why . . ." Like a tank releasing air underwater, the word bubbles rose feverishly, one after the other. Hands sat smiling as the bubbles appeared and disappeared. They came in a flurry. He raised his massive hand, chuckling. "These are not questions for me, Antela. Only The Advisor could answer such things."



The last of his word bubbles lingered as Jacoba took a breath. She didn't understand what Hands meant. She wondered how to ask better questions, ones so that he could understand all her fears and wishes. She had a thousand questions, even about Hands himself, but not one seemed right. "Where is this advisor?" she asked.

"The Advisor. You will find The Advisor in Square Circle." (●3) Hands word bubble was broad and pushed into Jacoba's space. She shrugged her head slightly to avoid it.

“A square circle? That doesn’t even make sense,” replied Jacoba.

Hands stood and spoke in a clear font, “What’s sense anyway?” He pointed one of his oversized fingers, “Square Circle. It’s on the other side of town. The easiest way is to take the train below the city. Exit in the Flower District and you’ll see the Square Circle. The Advisor will find you there. I think you should sleep before trying it. You can stay in the café, in the back. There are boxes of broccoli that will make for a soft bed.”

The idea of another night in the alley was worse than anything Jacoba could imagine. A bed of broccoli, in boxes or not, sounded better. She smiled at Hands, asking him to show her the way. She lay on the boxes. Hands turned off the light and everything was black. Hands closed the door and the sound “Click” showed up in a white word cloud. The door was locked for the night.



Jacoba lay on her bed. She thought it was strange that this world had things like broccoli. Shouldn’t they eat cooler food or no food at all? Shouldn’t they have purple drinks that fizzed or fruit with polka dots? Before another she could think about one more thing sleep came. (✍ 6)

Jacoba woke just as quickly. It seemed like one of her blinks. The morning sun, missing itself as an orb, shone a single tone of yellow in the world from its hiding spot. Jacoba walked out into the streets. Hands stood tall and broad next to her. He patted

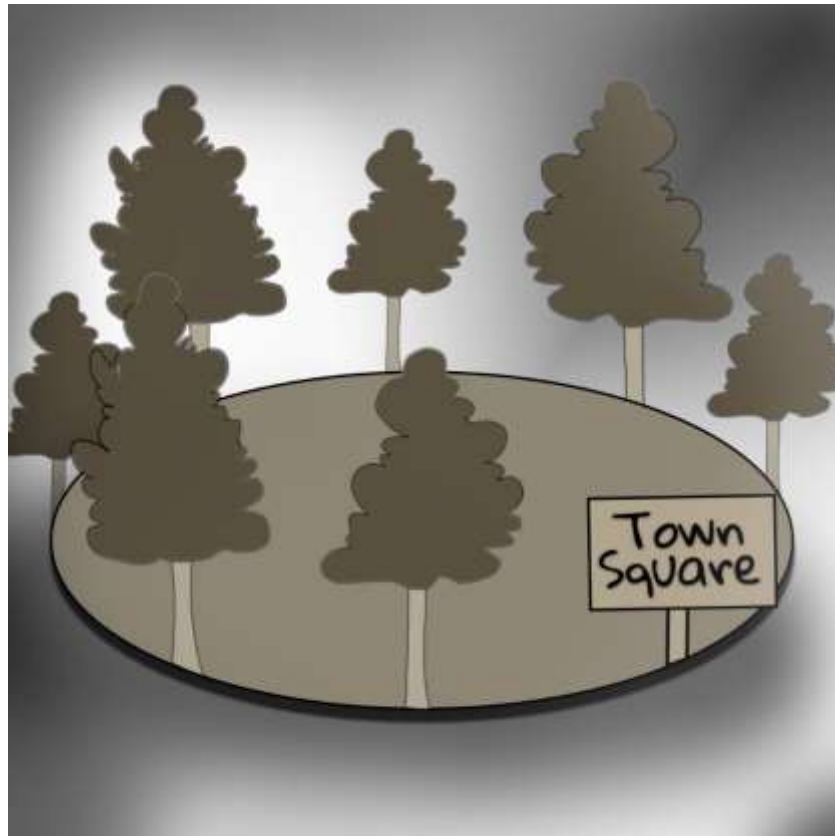
her on the back with more softness than Jacoba thought possible. He then pushed her down the road with a stiffness that was not surprising for a man that looked like Hands. Without a word, he handed Jacoba a train token. His big finger pointed in the direction of the rail station. (👉2)

Jacoba cautiously walked the streets. People spoke to each other on the sidewalk, like any day. But it was different for Jacoba. She dodged their word bubbles as though they would harm her. She tried to avoid big groups. They were more likely to have word bubbles.

The train depot looked like chaos to Jacoba. Characters . . . people . . . moved by her in all directions. Some were slow and some fast, but none as slow as her. Jacoba stood in the middle. People went around her like a pole in a stream of water. People repeatedly nudged her and cut in front of her. This annoyed her until she realized she could follow them to a train.

The train was made of different compartments. On the outside it was a single silver color with black circular windows. The doors to the compartments opened with word bubbles that read “Swoosh.” People ran inside quickly. There were tall characters and short ones, some had red faces, others black. Some had no hair and others had massive hair. Jacoba had forgotten to even think about what she looked like. She was pushed by a large woman pulling four kids. All of the kids held hands and the rope they created pulled Jacoba into the train. Everyone threw their token into a bucket on the floor. With each token, a green light blinked, and a word cloud showed “Beep.” The woman next to her nudged her with her elbow. Jacoba threw her own token in the bucket.

The underground world whipped by as the train car went from district to district. She kept her head down, still trying to blink the world back to normal. She hoped no one challenged her. The sounds and the people seemed so unfriendly. The whoosh of the cart left a trailed bubble as it moved. It read “Shwoo, shwoo, shwoo!” and Jacoba thought it unnecessary. A word bubble popped up over the door, “Electronic voice: ‘Next stop is the Flower District.’” Jacoba stood under the door’s bubble. Before it popped, the doors to the cart opened. The crowd moved and pushed Jacoba out of the train without looking back. She followed people up the stairs, back into the single toned light of the missing sun. Jacoba found it funny that in this world her eyes didn’t have to adjust. She could walk from black to white and her eyes were fine. She saw a large park, circular in shape. The sign read Town Square. She smiled to herself, realizing it was Hands’ “Square Circle.” (☒ 2 , 🖐 3)



Jacoba watched people walk the paths of the square. Statues stood in various poses around the paths. They looked just like the people of this world but in monotone gray. There were no pigeons to harass them. Vendors walked around the park with food and treats, no pigeons for them, either. The crowd coming out of the train station split around Jacoba. She stood like a statue herself, trying to decide where to go. People gave her a few shoves and pushes. She took a seat on a nearby bench, out of way of the train exit.

“How will I ever find The Advisor?” Jacoba’s word bubble popped up above her head. No one answered or read it. She scanned the buildings around the square, hoping for a sign or hint.

An elderly woman pushed a cart. The squeaks from the cart wheels surrounding Jacoba in bubbles. The woman stopped, turning back to look at her, and said “Glasses, young lady?” She swung her cart around, its parasail showing no hint of wind or movement. The woman had different eyeglasses displayed on top of the cart. The shapes, colors, and styles all varied from comical to stylish to practical.

“I don’t wear glasses,” Jacoba said as she waved her hand to decline.

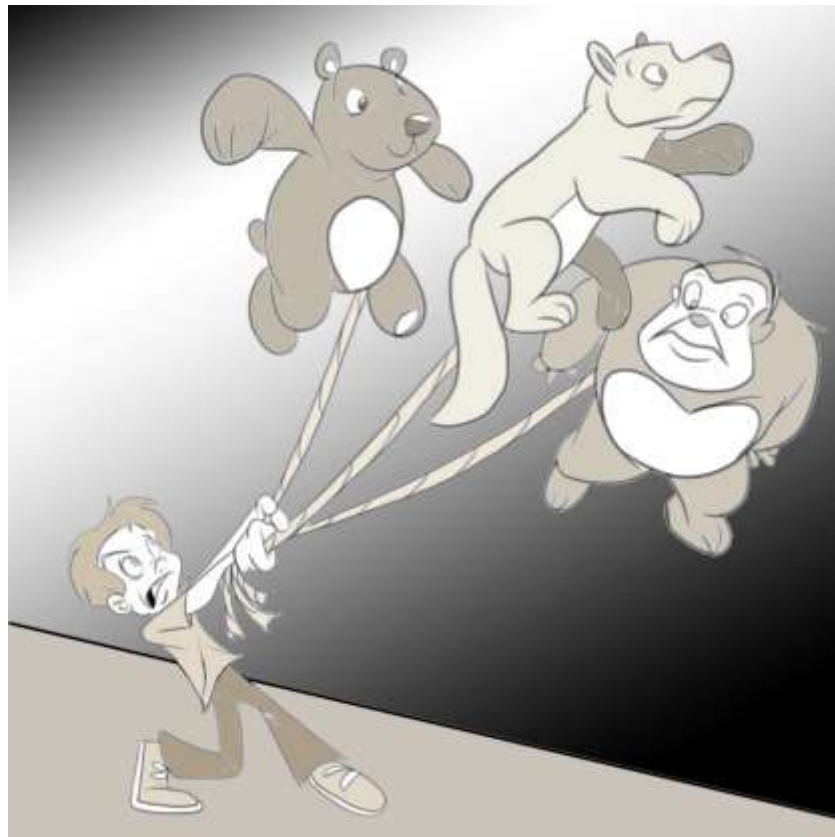
“Ah, but you do,” the old woman said. Her face had single line wrinkles leading to a head of silver hair. She wore long red robes. They were closest things to shiny Jacoba had seen in this world. The woman waved her hands in circular patterns at Jacoba’s eyes. “Everyone wears glasses. Not a single person doesn’t.”

Jacoba laughed, pointing at the old woman. “You’re not even wearing glasses!”

She meant it as a joke, but it looked harsher in the word bubble. She started to apologize, to clarify, when a blur of color caught her eye. Blurs were the symbol of motion and speed in this graphic world. Jacoba turned and watched another boy pulled by a tether. This time there were three beasts on the other end. His face was just squiggly lines as he did his best to hold on to the rope. He screamed. Jacoba looked back at the old woman. “Shouldn’t we help?” she asked.



“Help what, dear?” The old woman looked at her with a mischievous smile. “The boy there with his balloons?” and she offered Jacoba a pair of square, red rimmed sunglasses. Jacoba turned back to see the boy pulled around the circular square. The beasts ran so fast the boy now only had one hand holding the tether. Jacoba turned back to find the old lady still holding out a pair of glasses. She reluctantly grabbed them, put them on, and turned again. She saw a boy holding three balloons. The wind blew them hard, and he laughed as he tried to keep them from flying away. He tried running with them on the path around the park. People jumped out of his way, smiling and pointing. He looked hilarious.



Jacoba took off the glasses. She rubbed her eyes over and over again. The old woman held out a wrinkled hand. Jacoba swapped the red glasses for a blue pair with giant circular lenses. She waited to put them on her eyes. She looked over at the train exit. People stumbled and pushed each other as they rushed to their destinations. Jacoba slowly put on the blue eyeglasses and returned her view to the train exit. A lady dropped her bag, and her papers spread out across the steps. A man held out his arms blocking others from stepping on the documents. Another woman dropped to her knees, collecting the papers and handing them over to their owner. Jacoba looked back at the old woman with the cart. “What kind of glasses are these?” she asked.

The old woman smiled the same smile. “Glasses,” she said, “like any other. As I said, we all wear glasses. We all see with the lenses that we choose to wear.”

Jacoba laughed. “Well, in my world they don’t have glasses like these.” (👋4, 🖐️5, 🗨️3, 📐2)



“Your world, my world, The World. What is a world anyway except a place where people interact? It’s in the lenses, you see. Come now, hand me those,” the old woman took the blue glasses back. The woman turned from Jacoba and walked away. Her cart squealed its bubbles behind it. The squeak, squeak sequence of words broke in their bubble. The word bubble of The Advisor took its place, “Just decide which glasses you’re going to wear.”





Jacoba yelled out “You didn’t leave any glasses for me!” The old woman did not turn around and walked off. Jacoba’s head spun. She lay down on the park bench and looked at a pale blue sky. It had no color, really. She thought how much more beautiful it would be as blue, many shades of blue. In her world, even with no clouds, the sky had twenty different shades of blue. When there were clouds, their edges had more traces of grays, silvers, and whites than she could ever count. (👉 6, 📄 4, 📄 5)



Jacoba thought about her mom’s face. It had many shades of pink, beige, and tan. Jacoba grabbed her face. She ran her palms down her cheeks. She wanted the round shape back, the bumps and dips, the many colors, a scuff or two. She drifted off to sleep imagining a world of many tones. (📄 6 , 📄 7)

Her head sprung from her desk. Her graphic novel stuck to the side of her chin, wet and dangling like a lopsided beard. Jacoba peeled it off to the words of her mother calling for her. She shook her head to clear the haze. Her head looked left, right, and left again. It was her room. Her desk had lines with at least five colors of brown. She had a hole in her sock and it tickled her toe. She sprinted down the stairs. She stopped half way down. The stairs were ugly, really ugly. They had dark stains and light stains. They had tears and snags from a cat that kept scratching it. The stairs were all shades of brown, yellow, and gray. She stuck her head down close enough that the fabric tickled her nose and gave it a sniff. It wasn't a strong smell but there was a scent and it was awful. She loved it. Jacoba continued down the stairs. She hugged her mom as strongly as she could. Her mom turned her head, smiling at the burst of unexpected affection. Her mom raised her eyebrows as she asked Jacoba, "Where'd you get those glasses?"



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Veteris took a long breath after finishing his story. He closed his eyes and felt a slight breeze. It tickled the skin on his face. He opened his eyes again and looked at Sufi.

"So, what do you think of that?" he asked. Sufi shrugged her shoulders. "I guess I need Jacoba's glasses." Veteris laughed and shook his head. He put his hand on her shoulder, "Maybe I should tell you that story again." (7)

## Connections



### Connection Art and Writing:

- 1 **Sufi's Emotions:** participants identify feelings and suggest coping skills. Students draw the outline of Sufi's body and write notes inside identifying her feelings, outside the body they add notes suggesting what she should do to cope with frustration or anger. (p. 3)
- 2 **Scale Model of Jacoba:** Students will create a scale model of Jacoba using recycled materials. (p. 4)
- 3 **Draw**, paint, or sculpt the "Monster". Encourage students to create their own interpretation of what the "monster" in the story might look like. (p. 5)
- 4 **Draw** the described place in 2D or 3D using perspective (p. 7)
- 5 **Jacoba meets Hands:** Participants create a graphic novel of the scene where these two characters meet. (p. 9)
- 6 **Imagine the Food:** Encourage students to imagine crazy food they would expect to find in this world. Have students draw, create, or write a recipe for these crazy foods. (p. 11)
- 7 **Which glasses are you wearing today?:** Students draw the same situation perceived differently depending on the glasses they put on. (p. 18)



### Connection points:

- 1 Sufi, Veteris, and Fidel are featured in *Fidel the Space Dog*. Sufi befriends Iso and Euclid in *Fidel the Space Dog*. Euclid is Resu's grandson.
- 2 Escape from Disce graphic novel: Pages 13 onward – The kids work on using mirrors, lenses, and light to be able to see over the city walls.



### Connection Media:

#### Videos:

- 1 5 Minutes Bodyscan Meditation for Classrooms and Students - Mindfulness For Kids by Fablefly – The Whole Child (Time: 5 min) (p. 3)  
<https://www.youtube.com/watch?v=9A0S54yAgEg>
- 2 Da Vinci's Vitruvian Man of math - James Earle by TED-Ed (Time: 3:30 min) (p. 13)  
<https://www.youtube.com/watch?v=aMsaFP3kgqQ>

- 3 NASA's 3-D Tour of the International Space Station by NASA Marshall Space Flight Center (Time: 4 min) (p. 16)  
<https://www.youtube.com/watch?v=MQEkFppWaRI&t=97s>
- 4 Why Is the Sky Blue? (Ask an Astronomer) by NASA Spitzer (Time: 3 min) (p. 17)  
<https://www.youtube.com/watch?v=xRh2OeOCRpQ>
- 5 NASA-EMS: Visible Light by V! Studios (Time: 5 min) (p. 17)  
<https://vimeo.com/60980665>
- 6 Our Senses: How Mammals See the World in Many Colors by American Museum of Natural History (Time: 2 min) (p. 17)  
<https://www.youtube.com/watch?v=Qy0YBUgBXcA>

### Interactive Websites

- 7 Color Calculator by Sessions College for Professional Design (p. 17)  
<https://www.sessions.edu/color-calculator/>



### Connection Activity:

- 1 **“2D or 3D World”:** In teams of 2 or 3 participants, make a list of advantages and disadvantages between 2D and 3D world. In order to remember 2D shapes, participants will have 3-5 minutes to list 2D shapes and characteristics (shape, name and formula for area). For 3D shapes, students make a list of: number of surfaces, edges and vertices. *Extension: calculate areas and volume of different shapes and objects.* (p. 6)
- 2 **“Jacoba goes to meet the Advisor”:** Using Ozobots, help Jacoba get to the “Square Circle”. (p. 12)
- 3 **Are You Leonardo’s Vitruvian Man?:** In this activity students will measure themselves to determine if they compare to Leonardo da Vinci’s famous depiction of the Vitruvian man. (p. 13)
- 4 **Build Your Own 3D Glasses!** In this activity, students will create their own 3D glasses. (p. 16)
- 5 **Create Your Own 3D Images:** In this activity, students will create their own three-dimensional images (3D) using technology. (p. 16)
- 6 **See the Light:** Students will use prisms and glue sticks to explore the properties of light. The activities demonstrate how white light is made up of a series of colors across the visible spectrum, and how these colors can be scattered. Students will observe how light exiting different mediums, such as prisms and glue sticks, changes the color of the light they see. Students will compare their observations in the classroom with their knowledge of sky color and rainbows in the natural environment. (p. 17)

### Easter Eggs in the Story:

- 1 Fidelis Canis, Fidel for short, means faithful dog in Latin. The dog is a giant, a mix of an Irish Wolfhound and a Great Dane, so it's a Great Wolfhound. (p. 1)
- 2 Veteris is a Latin word for "old" – how do you think he feels about his name? (p. 2)
- 3 Square circle is a problem proposed by ancient geometers. It is the challenge of constructing a square with the same area as a given circle by using only a finite number of steps with compass and straightedge. (p. 10)

### Additional resources:

#### Art

- Scale Drawing by Math is Fun:
  - <https://www.mathsisfun.com/definitions/scale-drawing.html>
- How to Draw Perspective Landscape by Art Projects for Kids:
  - <https://artprojectsforkids.org/draw-perspective/>

#### NASA

- NASA for Educators
  - <https://www.nasa.gov/audience/foreducators/index.html>
- NASA eClips
  - <https://nasaclips.arc.nasa.gov/>
- NASA Wavelength
  - <http://nasawavelength.org/>
- NASA Space Place
  - <https://spaceplace.nasa.gov/>
- Tour of the Electromagnetic Spectrum by NASA:
  - [https://science.nasa.gov/ems/01\\_intro](https://science.nasa.gov/ems/01_intro)
- Observations Across the Electromagnetic Spectrum by NASA's Goddard Space Flight Center:
  - [https://imagine.gsfc.nasa.gov/science/toolbox/emspectrum\\_observatories1.html](https://imagine.gsfc.nasa.gov/science/toolbox/emspectrum_observatories1.html)
- Herschel Space Observatory by NASA's Jet Propulsion Lab:
  - <https://herschel.jpl.nasa.gov/>
- NASA's SDO Observes 'Cinco de Mayo' Solar Flare by NASA
  - <https://www.nasa.gov/feature/goddard/nasas-sdo-observes-cinco-de-mayo-solar-flare>
- Why is the Sky Blue? By NASA Space Place
  - <https://spaceplace.nasa.gov/blue-sky/en/>
- Explore the Electromagnetic Spectrum with "Magic Windows" by NASA Space Place
  - <https://spaceplace.nasa.gov/magic-windows/en/>
- Cosmic Colors by NASA Space Place
  - <http://spaceplace.nasa.gov/cosmic-colors/en/>