

A Common Core and STEM Curriculum Guide to

Astrotwins: Project Blastoff

By Mark Kelly



About the Book

Energetic twins Mark and Scott Kelly plan to study their dad’s calculator by taking it apart. After a disastrous result, their consequence for destroying the calculator is a week at Grandpa’s house, doing chores. While the boys are there, Grandpa suggests they direct their energy and curiosity to building something. He suggests a go-kart.

However, Mark and Scott like to think bigger than a simple go-kart. They decide to build a spacecraft and become the first kids in space. With the help of brainy Egg, whose real name is Jenny, and other kids they meet, the group begins building a rocket that can launch into space. Working together, they finally are ready for the big launch day. Can they actually pull off a successful launch and send the first kid into orbit?

Prereading Questions

Is there a limit to what kids can do? If so, where would that limit be? Support your answers with examples from your life or articles you’ve read about great things kids have done, discovered, or achieved.

What does it take to send someone into outer space to orbit the Earth? What kinds of things would you need for a trip into space?

Discussion Questions

The following questions may be used with *Project Blastoff* as writing prompts or used to introduce class discussion and reflection. The questions contained in this section particularly address the Common Core State Standards: (RI.3–7.1, 3, 4) (R.3–5.10) (RL.3–7.1, 3, 4, 10)

1. What gives you the first hint Scott and Mark are lively, curious boys?
2. When Mark and Scott first discussed who would go into space, Mark said, “Girls can’t be astronauts.” What do you think of this statement and how does it show the social situation in the decade when they lived?
3. What is the relationship between Mark and Scott as brothers and with their parents? Are their interactions in any way similar to or different from your family’s?
4. Mark and Scott do many chores around the house and in the yard. Do you have chores? Are they similar to or different from the chores done by the twins?

5. The library played an important part as the kids learned what they needed for their project. How do you use the library? Is it in the same way that the group did? What has changed in libraries since the 1970s?
6. Is the setting an important part of the book? Explain your answer.
7. When the kids were working on the rockets, why did the adults keep saying, “Don’t blow anything up!”
8. Do you see changes in Mark and Scott as their plan progresses? How do they change, if so?
9. Mark said that math is a universal language. What does that mean? Do you agree with the statement?
10. President John F. Kennedy challenged the nation to put a man on the moon. Reread President Kennedy’s quote and discuss its meaning and significance. Follow up with Grandpa’s quote, “The president’s point was that sometimes you do the hard thing because doing hard things is good for you.” Have you had something happen in your life where you chose to do the hard thing? What was it? How did you feel afterward?
11. Could the twins have managed to get into space without the others? How did working as a group benefit the project and what did each person bring to the project?
12. Was the contest to decide who went into space a good one? Was it fair? What kind of a contest could the kids have done instead?
13. How did Mark feel when he won the contest to be the astronaut? How did Scott feel?
14. How do you think Mark felt when he couldn’t be the astronaut after his injury? What do you think were Scott’s feelings?
15. What is the value of making a schedule and sticking to it? Are there disadvantages to having a schedule?
16. What do you think about the missions being named Project Blastoff? What about the name for the rocket, *Crazy 8*? Can you think of other names that would suit the projects as well?
17. Why did Mark and Scott spend so much time practicing their simulations? Did it help when it came time for launch and orbit? Explain why.
18. What effect did the cookie crumbs have on the mission? Was it a good idea to have sent them? Explain the forces that caused the problem with the crumbs.
19. Discuss the consequences of the space mission, both from the point of view of the adults involved and the *Crazy 8* team’s classmates. Were the consequences fair and appropriate? Why or why not?

20. What were the three biggest obstacles Mark and Scott encountered in planning their rocket launch?

21. Who of the group do you think is most likely to end up with a career in space? Who might end up an astronaut? Who would be suited to work in Mission Control?

22. Scott and Mark learned many things from their adventure. Discuss some of the lessons they learned.

23. Review the Author's Note in the back matter. Discuss the parts of the book that are real and the fictional parts. How do you think author Mark Kelly's life influenced this story?

Writing

The writing prompts contained in this section particularly address the Common Core State Standards: (W.3.1.a, b, d) (W.3.2.a, b, d) (W.3.3.d) (W.3.4) (W.3.8) (W.4.1.a, b, d) (W.4.2.a, b, d, e) (W.4.3.a, d, e) (W.4.4) (W.4.8) (W.5.1.a, b, d) (W.5.2.a, b, d, e) (W.5.3.d, e) (W.5.4) (W.5.8) (W.6.1.d) (W.6.2.a, b, c, d, e) (W.6.3.d, e) (W.6.4) (W.7.1.d) (W.7.2.a, b, d, e, f) (W.7.3.d, e) (W.7.4)

1. Write a descriptive passage about Scott's feelings as he launched and circled Earth in the rocket. Include how he felt at various times during the trip and upon landing.

2. Read about the Apollo 1 disaster in 1967. Write to explain the event and relate it to Mark and Scott's concern about going into space.

3. Write a summary of the story and identify the main idea and theme in it.

4. Write a personal essay about the adventure in the voice of Scott, Mark, Egg, or Barry.

5. Write a letter to one of your friends and try to convince the friend to join you in a plan for an adventure requiring building something that might not be a good idea. Describe the adventure and device you'll be making and persuade them to work with you.

Setting

The activities contained in this section particularly address the Common Core State Standards: (RI.3–7.1, 3)

1. Find examples from the book that show the times the events in the book are taking place.

2. Compare where the Kelly family lives with Grandpa's home. What differences in the locations helped lead the boys to build a rocket to launch one of them into space?

3. Could the story have been set in a later decade and still be the same story? Why or why not?

Characters

The questions contained in this section particularly address the Common Core State Standards: (RI.3.1) (RI.4–7.1, 3) (RL.3–7.1, 3)

1. Describe the kind of boys Scott and Mark are and give examples from the book to support your description.
2. How did Scott and Mark feel about meeting Jenny for the first time? Why do you think they felt this way?
3. Why did Scott and Mark decide to call Jenny “Egg?”
4. What part did Egg (Jenny), Barry, and Howard play in developing the rocket and what jobs did they perform? Would Mark and Scott have been able to successfully launch without their help?
5. What can you infer about Barry’s brother, Tommy? What happened to him in the Vietnam War? How did this affect Tommy?
6. Discuss the relationship Egg and Steve Peluso have with each other. Why do you think they are so competitive? Is there a class or sport in which you are competitive with another person?
7. How did the different personalities come together to work and complete the rocket and what were their disagreements about? Did each person bring something different to the group and what resulted from their differences?
8. Compare and contrast two characters from the book. Identify the characteristics that made them disagree or work well together.
9. How did an event in the story affect one of the characters? Tell how it did and what resulted from that particular event.
10. Which character would you like to get to know better? Explain why.

Plot

The questions contained in this section particularly address the Common Core State Standards: (RL.3–7.1, 9) (RI.3.1, 9) (RI.4–5.1, 3, 6, 9) (RI.6.1, 6, 9) (RI.7.1, 9)

1. Use the NASA site and books or articles about John Glenn’s first trip into space to read or research the historical event. Describe the similarities and differences of Mark’s trip with Glenn’s actual flight.
http://www.cleveland.com/friendship-7/index.ssf/2012/02/friendship_7_john_glenns_space.html
2. What part did Grandpa and Nando Perez play in helping the group build their project? Could they have completed the mission without their help? Give examples of how they added to the project and enabled the kids to succeed.

3. In what ways did Mr. Drizzle play a critical part in helping with the project? Give examples from the book that show what he did.
4. Why was it important to the kids to keep the project a secret? Give evidence from the book that supports your explanation.
5. Identify the theme of the book and explain how different parts of the plot contributed to its overall theme.
6. Compare and contrast the adventure Scott and Mark had with another adventure from literature. Identify the pattern of the two books and tell how they are alike and different from each other. Were the themes somewhat alike? If they were, tell how.
7. Read a nonfiction book about early space flight. Compare and contrast the two stories. Were there differences in the science portrayed in the two books? (See bibliography in the book's back matter.)
8. Could middle school students really build a successful rocket and launch someone into space? Explain your answer.

Point of View and Structure

The questions contained in this section particularly address the Common Core State Standards: (RL.3.5, 6) (RL.4.6) (RL.5.5, 6) (RL.6.5, 6) (RL.7.6)

1. The story is told in third person. Why do you think the author chose to tell the story this way rather than from Mark's or Scott's first person point of view? Would it have made a difference if it had been told in first person?
2. The story structure follows the events in chronological order. Explain how each chapter contributed to the building of the story. What would be the difficulties in using an order that was not sequential in this book?
3. How did the first chapter indicate events that might take place later in the book? Use details to show how the boys' behavior could lead to future events that took place.

Vocabulary

The questions contained in this section particularly address the Common Core State Standards: (RL.3–7.4) (RI.3–7.4)

1. Choose several of the science vocabulary words and explain how the context helped you understand the meaning of the words.
2. Use the glossary in the back matter of the book to select three to five words. Look up the words and learn more about the object or principle and the science behind them. Write to explain the selected words and give an example of how it applies or is used.

3. Find two or three examples of figurative language and explain their meaning.
4. Did any of the language in the book give clues to the setting and period of time when the story took place? Give examples.

Science, Technology, Engineering, and Mathematics (STEM)

Science

(Next Generation Science Standards:

(Grade 3 PS2.A: Forces and Motion, PS2.B: Types of Interactions)

(Grade 4 PS3.A: Definitions of Energy, PS3.B: Conservation of Energy and Energy Transfer, PS3.C: Relationship Between Energy and Forces, PS4.B: Electromagnetic Radiation)

(Grade 5 PS1.A: Structure and Properties of Matter PS1.B: Chemical Reactions, PS2.B: Types of Interactions, ESS1.A: The Universe and its Stars, ESS1.B: Earth and the Solar System)

(Middle School PS1.B: Chemical Reactions, PS3.A: Definitions of Energy, PS2.A: Forces and Motion, PS2.B: Types of Interactions, PS3.B: Conservation of Energy and Energy Transfer, PS3.C: Relationship Between Energy and Forces, PS4.B: Electromagnetic Radiation, PS4.C: Information Technologies and Instrumentation, ESS1.A: The Universe and Its Stars, ESS1.B: Earth and the Solar System)

1. What are Newton's Three Laws of Motion? Explain them in your own words and give an example of each one.
2. List some examples of the protective devices the group used to keep Scott safe while he was in the spacecraft. Why do you need protection when traveling in space?
3. Explain the fuel source they used. How did the author make this sound as if it were actually a real kind of fuel?
4. Explain the force of gravity and discuss the problems launching a spacecraft has in relation to gravity.
5. How did Scott describe what he saw while in orbit? Discuss the feelings he experienced on takeoff and re-entry and relate them to science terms from the glossary.
6. Look up and read about the different kinds of electromagnetic energy. What kinds of electromagnetic radiation would Scott have encountered in space?

Technology

1. What technology tools are available now that were not around at the time of the book's setting? What tools were used at the time and what changes have taken place in technology since the 1970s?

2. Look up early computers. Discover what BASIC is and compare the early computers to those used today.

3. What was their communication solution and what went wrong? How was it repaired?

Engineering

(Gr. 4 ETS1.A: Defining Engineering Problems, PS4.C: Information Technologies and Instrumentation, ETS1.B: Designing Solutions to Engineering Problems) (Grade 5 ETS1.A: Defining and Delimiting Engineering Problems, ETS1.B: Developing Possible Solutions) (Gr. 6 ETS1.C: Optimizing the Design Solution) (Middle school ETS1.A: Defining and Delimiting an Engineering Problem, ETS1.C: Optimizing the Design Solution)

1. What did Scott, Mark, and the other kids need to include on their control panel? Refer to the book and list the items they incorporated that are necessary for a successful flight.

Look at this diagram and see if you can identify any of the control panel items.

http://upload.wikimedia.org/wikipedia/commons/8/8b/Control_panels_mercury_atlas_6.png

or

<http://cdn3.volusion.com/qhwyd.ybxka/v/vspfiles/photos/M1702-2.jpg?1385051208>

2. Did the group behave like engineers in planning and building the project? How so?

3. Give examples of how the group overcame limitations in material available for building and fueling a rocket and space capsule.

4. What steps did the group take to learn what they needed to know in order to design their rocket?

5. Engineering is based on repeating and testing a process until the best design possible emerges. What flaw did the group have in their engineering of the spacecraft? Justify how they still could have succeeded, even without following a repeated testing series.

Mathematics

1. Research slide rules and read about them. Identify the parts and name them. Explain how to calculate using one.

2. Look up algebra and then review to see what the book says about algebra. Learn three terms associated with algebra.

3. Discuss the differences between mathematics and arithmetic.

Activities

The activities contained in this section particularly address the Common Core State Standards: (RL.3–7.1) (RL.4.7) (RL.5.2) (RI.3–7.1, 3) (RI.4.7, 8) (RI.5.8) (RI.6.8) (RI.7.7, 8) (W.3–4.1, 2, 4 7) (W.5–7.2, 3, 4, 7)

(Math Content.3.OA.C.7) (4.MD.A.1) (5.NBT.B.5) (5.MD.A.1) (5.MD.C.5) (6.EE.A.2) (6.EE.B.6) (7.EE.B.3, 4) (7.NS.A.1.d)

1. Research Sir Isaac Newton. Make a presentation to show his biographical information.
2. Trace inventions from the 1970s up through today and create a technology time line to show the progress.
3. Design experiments that will show Newton's three laws of motion. Present them to another class or record them and give a class presentation.
4. Look up the books in your library that fall between 530 and 539 in the Dewey decimal system. What titles did you find? Would they have helped the group figure out the answers to their questions?
5. Listen to a recording of President Kennedy's speech about going to the moon. How does it differ from Grandpa's paraphrasing?
6. Investigate and research welding. What sorts of things are welded? What would you need to have and know before starting a welding project?
7. Plan a building project you might do with a group. Do research to find out how to build your project. Set up dimensions and include the sizes and measures of each part of it. Inventory your materials, find out where to get what you don't have, and make a schedule. Carry out the plan if possible.
8. Create a chart of the different kinds of electromagnetic energy. Illustrate it and show examples of each kind of electromagnetic energy on the spectrum. Include wavelength diagrams.
9. Interview someone who used a slide rule during the 1950s – 1970s. What were the advantages and disadvantages?
10. Read about waves. Make a diagram showing the vocabulary used to discuss waves and illustrate it with examples.
11. Research gyros. Report on them and how they work. Include their purpose and examples of practical use.
http://www.pilotfriend.com/training/flight_training/fxd_wing/gyro.htm
12. Look up Robert Goddard. What is he known for?
13. Role-play an interviewer talking to Mark and Scott after Scott's successful return to Earth. Write out the interview questions and the boys' answers. Present the interview to other students or tape it and show it to the group.

Guide written in 2015 by Shirley Duke, a children's freelance writer.

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