

Teacher's Guide for ODYSSEY

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Kids with BIG Ideas

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Teacher's Note:

This guide contains project ideas, short answer, extended response, fill-in, and true/false with correction. The variation is designed to have the students think critically, as well as to test their comprehension. An answer key to the short answer sections can be found at the end of the guide.

Extended Response: Comprehension & Critical Thinking

The questions below can be used as written, simply answered in complete sentences or easily transformed into longer essay (ELA) style questions, or even research topics. In any case, have the students support their answers with details from the text or use critical thinking skills to create a thorough and interesting answer. The questions, essays and projects have been aligned with the **Common Core Standards**. Consider the level of your students when deciding how to use the questions.

Project Idea: Smithsonian Spark!Lab Invent It Challenge

Participate in the fourth annual Invent It Challenge beginning January 17, 2015. All students complete the same challenge: **to create an invention that solves a real-world problem** (individually or in groups). Submissions due by March 27, 2015.

Find everything you need to help students register and complete this year's Challenge at: <http://challenges.epals.com/invent>. You'll find support to help you implement the project in your classroom, including:

- **Real inventors** who are sharing tips and ready to answer your students' questions
- **Instructional Resources** to support the Invention Process, including lessons and a scoring rubric
- **Social media tools** for students to communicate and collaborate as they complete the Challenge

And as you and your students read this issue, look for articles showcasing some of last year's winners and the Spark!Lab's Process for Invention. Your students could be featured in an issue of Odyssey next year or win other prizes. Happy Inventing!

"Outwitting Ticks" p. 8-10

1. What problem did Megan Lim set out to solve? What was her motivation?
2. What serious illnesses can tick bites lead to?
3. What are some currently existing tick removal options?
4. How does Megan's design idea differ from the other options on the market?
5. How did she create a prototype? Was it successful?

6. What improvements did she make on her original design?
7. Explain Megan's plan for selling her product.
8. Imagine that this was YOUR creation. Think up another improvement to be implemented and explain your reasoning.

"The Hollow Flashlight" p. 11-15

Read the article in its entirety and then fill in the blanks. Refer back to the text if necessary.

1. At age 15, Ann Makosinski invented a flashlight that uses no _____.
2. The flashlight is powered only by the warmth of a _____.
3. This invention could benefit 1.3 billion people (one-fifth of the world's population) who do not have access to _____.
4. While researching alternative energy forms, she learned that the human body is a great source of _____ energy.
5. The average human radiates enough energy to light a _____-watt light bulb.
6. Peltier tiles operate according to the _____ effect: when one side of the tile is heated, and the opposite side is cooled, electricity is generated.
7. Producing electricity through temperature differences is known as _____ power.
8. _____ air is the air in and around a building or device.
9. Only 0.5 _____ of power is needed to obtain sufficient LED brightness, and 2,500 _____ are needed.
10. Electricity is the movement of _____ charged atomic particles called electrons.
11. _____ are the units used to measure the rate electrons flow in a current.
12. _____ measure the force of moving electrons.
13. In order to work, the flashlight required a _____-degree temperature difference between outside air and body heat.
14. Although energy can never be created or destroyed, it can change _____.

"Hack the Hood" p. 20-23

1. What is "Hack the Hood" and why did it come into existence?
2. Describe the structure of the Hack the Hood pilot program.
3. What is the goal of the program?
4. In what ways does the Hack the Hood program 'mirror the work sector'?
5. How is the Hack the Hood helping the community and small businesses?
6. How do mentors play an integral part in this program?
7. How successful was the program in its first year?
8. What are some of the benefits for the participants?
9. Explain the expansion plan for Hack the Hood.

"Six Sigma" p. 24-28

1. Explain several ways that energy can be extracted from the wind.
2. Give a detailed explanation of the TWINBine.
3. Why does the Six Sigma team predict that plenty of paying customers will want a compact turbine like the one they have created?
4. Who is the small turbine appropriate for?
5. Where can these small turbines provide power to?
6. What is kinetic energy, and how does it apply to the TWINBine?
7. What factors does the amount of kinetic energy a rotor converts to mechanical energy depend on?
8. What is the main challenge that every small turbine must overcome?
9. How does the TWINBine match up against its real-world competition?
10. Since energy cannot be created, how do we harvest energy from the wind?

"Lloyd Godson" p. 29-33

1. How would you describe Lloyd Godson's personality?
2. Why has Godson drawn the attention of NASA, medical and psychological experts, as well as designers, builders, and dreamers?
3. What were Godson's father's words to him every night, and how did he take these words to heart?
4. What does Godson hold the Guinness World Record for?
5. What is the BioSUB, and what were some of the details of its construction?
6. Despite the precautions taken, what were some of the occurrences that caused Godson to end his experiment in the BioSUB?
7. What did NASA hope that Godson's underwater experiment in LEGOLAND could help them predict?
8. Why is the habitat of Asterias and its plan of placement so unique?
9. Why is filling the lower portion of the sphere with ballast necessary?
10. How were students at Cascade High School an integral part of Godson's experiment?
11. How are students at a technical school in New South Wales trying to help the project, as well?

Essay: Write a short essay explaining why it is so important to be a 'dreamer' when attempting to create and experience things that seem out of reach. Use at least one example from your own life and support your essay with specific details.

"Team Efforts" p. 34-39

Mark the following statements TRUE or FALSE. Provide the correct answer if false.

1. _____ Around the world, about 250,000 kids between the ages of 9 and 16 spend their free time working with robots.
2. _____ Individually, children program LEGO MINDSTORMS robots that they enter in competitions against their opponents.
3. _____ The theme for 2014's competition was "Nature's Fury".

4. _____ The Brain Buster team decided only to create an invention that would use electricity.
5. _____ The final design that the Brain Busters submitted to FLL included a five-foot balloon that was filled with fresh oxygen.
6. _____ The team attached the whole system to the ground with a long coil of Kevlar string.
7. _____ The Brain Busters made a scale model out of a small balloon and paperclips.
8. _____ Unfortunately, their model did not do well in severe weather.
9. _____ Improvements on the original idea include adding lights and a Wi-Fi transmitter.
10. _____ The most common natural disaster that plagues Iowa is tornados.
11. _____ The Robotic Raider's Cyclone Survivor Board Game can easily be tweaked to deal with hurricane safety, tsunami safety, or even wildfire safety.
12. _____ The idea for this product crystallized after the local sheriff came to talk to the boys about the importance of making school emergency kits.
13. _____ When testing the Survivor Board game, the children's knowledge of how to handle the emergency increased by 20 percent.
14. _____ Before Robotec submitted their design on an invention to improve upon the tsunami evacuation system, they made scale drawings.
15. _____ Robotec's invention includes using LED lights to indicate the way to safe areas, as well as broadcast the danger level through different colored lights.

ANSWER KEY

"Hollow Flashlight"

1. *batteries*
2. *human hand*
3. *electricity*
4. *thermal*
5. *100*
6. *Seebeck*
7. *thermoelectric*
8. *ambient*
9. *milliwatts/millivolts*
10. *negatively*
11. *amps*
12. *volts*
13. *nine*
14. *form*

"Team Efforts"

1. *True*
2. *False, they collaborate*
3. *True*
4. *False, would not need electricity*
5. *False, helium*
6. *True*
7. *True*
8. *False, did very well*
9. *True*
10. *True*
11. *True*
12. *False, home emergency kits*
13. *True*
14. *False, created small prototypes*
15. *True*