

MARKET RESEARCH & DESIGN: THE HEADPHONE CHALLENGE

Level of Difficulty: 3

Grade Range: 9-12

Activity Time: 45-60 min

Business Category: IT (Manufacturing)

Topic: Engineering Design

OVERVIEW

Who designs all of those new headphones on the cutting edge of technology? What steps are needed to take an idea out of the boardroom and into the store? In this lesson, students will work in teams to design a pair of headphones specifically for children under three. They will assume the roles of three professionals—market researchers, biomedical engineers and industrial designers—in order to design a prototype. They will use a smartphone and the free augmented reality application Aurasma to present their prototype to the class.

STEM LESSON FOCUS

Engineering Design Cycle

- Creating or Prototyping

21st Century Skills

- Creativity

OBJECTIVES

Students will be able to:

- **Understand** the steps involved in designing and manufacturing a new product,
- **Apply** that knowledge to a product in order to **create** an original prototype of headphones and,
- **Evaluate** the designs of their peers using the augmented reality application.

MATERIALS

For this lesson, students will need:

- A smartphone or tablet with a camera and access to the internet (one per student)
- The *Headphone Challenge Worksheet*
- *Headphone Challenge Rubrics Student Worksheet*

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- Wavelength Aura
 - The free application [Aurasma](#), which can be downloaded on a smartphone or tablet with either an iOS or Android operating system
 - A computer with access to the internet
 - A projector or screen
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HAVE YOU EVER WONDERED...

How the technology that we use every day gets designed? Audio equipment like speakers and headphones convert electricity into sound. Sound equipment spans a range of different applications, from the largest concert hall to one person's ears. Market researchers use tools like focus groups and surveys to find out what features and benefits consumers want in an audio product.¹ Then, a team of designers and engineers use the engineering design process to make those features and benefits happen.

How we can use augmented reality to communicate ideas in a new way? Augmented reality is the force behind wildly successful games like Pokemon Go and wearable technology like Google Glass. Augmented reality can also be used to present knowledge and ideas in a compelling way because of its kinesthetic qualities. Free and easy-to-use applications like [Aurasma](#) allow users to design augmented reality projects and are a clever way to make presentations engaging and fun. This methodology helps students retain knowledge in a new way and gives them marketable skills for the technology workforce.

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MAKE CONNECTIONS!

How does this connect to students?	How does this connect to careers?	How does this connect to our world?
<p>Students will learn how some of their favorite products are developed by teams of professionals who specialize in marketing, engineering, and design. This interactive project will also enable students to use the multifaceted technology of augmented reality to enhance their presentation skills.</p>	<p>Market researchers gather, interpret and utilize consumer behavior data in order to help companies create products that consumers want and need.¹</p> <p>Biomedical engineers combine expertise in manufacturing design with the scientific principles of biology in order to design devices for use in a variety of industries.²</p> <p>Industrial designers combine art and engineering to make the appliances, toys and technology devices we use every day.³</p>	<p>Smartphones and media players are nearly ubiquitous in modern society. These devices must combine form with function by looking good, sounding great, and meeting the needs of diverse groups of users. Headphones must deliver great quality sound while also keeping users' ears safe from injury. Students will be able to apply the understanding they gain in this interactive activity to the technology they utilize every day.</p>

If you want students to further explore career opportunities connected to this topic, please allow for more classroom time.

BLUEPRINT FOR DISCOVERY

Follow the instructions below to complete the activity.

1. Assemble students into groups of 3.
2. Provide each student with the following.
 - a. Smartphone or tablet that is sufficiently charged, connected to the internet, and has the application Aurasma downloaded (([Aurasma](#) is a free application that can be found on either the iOS or Android App Store).

Note: prior to engaging in this classroom activity, it is recommended that educators utilize [this teacher's guide](#) in order to familiarize themselves and their students with the Aurasma application.

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- b. One copy of the ***Headphone Challenge Student Worksheet*** per student.
3. Instruct each group they will be working in teams for a role-playing activity and either hand out or discuss the following prompt with student groups:
 - a. A leading technology company named SonicSolutions, Inc. wants to set itself apart as a leader in the field of audio products designed specifically for toddlers ages three and under. This audience has specific needs in terms of biology and design, and this is a new field for SonicSolutions, Inc.
 - b. They want to begin their new product series by designing a pair of headphones. The company’s board has hired different teams of experts (you and your group members!) to come and “pitch” them innovative headphone designs for children under three. The team with the best product “pitch” will be awarded with the project.
 - c. Each member of your team will assume one of these professional roles—market researcher, biomedical engineer and industrial designer. You will perform a specific task related to your role and bring your work back to your group.
 - d. Then, each group will compile that work in an interactive “pitch” presentation using the Aurasma application in order to convince the SonicSolutions Inc. board (played by your classmates) to select your team. Presentations have to be 60 seconds or less, so you don’t have long to make your case! It’s your group’s responsibility to get SonicSolutions, Inc.’s board excited about this new product, so make sure your presentation is engaging and thorough.
 - e. The board will rate your presentation on their rubrics, and the team with the best presentation will win the project!
4. Allow students time to select the role they will play in their group and perform the specific duty related to that role, as listed on the ***Headphone Challenge Student Worksheet***.
5. Give students time to compile their information and create their “pitch” presentation using Aurasma. Demonstrate the capabilities of the app by inviting students to view the ***Wavelength Aura***. Students can use this app to make images come to life with video or a different image.
6. Hand out ***Headphone Challenge Rubrics Student Worksheet*** to groups, giving each group enough rubrics to assess all project teams’ presentations (it is recommended that students work in teams to assess the presentations). Invite the first group to the front of the class to give their presentation. Remind students that they have one minute to make their pitch to the SonicSolutions, Inc. “board”. Have students load their Aurasma image on the screen and begin their pitch (you may want to set a timer for 60 seconds in order to keep the time precise). Give the student audience “board” 30 seconds to complete their rubrics. During this time, the next group will come up and load their Aurasma

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project. After all groups have presented, collect and compile the student rubrics. Tally up the total number of points each team received in order to determine the winning headphone design (20 minutes).

TAKE ACTION!

Inspired? Students and educators can use the following resources to learn more about market research, biomechanical engineering and industrial design:

[Network for Teaching Entrepreneurship \(NFTE\)—Chocolate Bar Activity \(Giving Your Students the Tools to Use Market Research Effectively\)](#)
[DiscoverE Engineering—Cool Content and Activities](#)
[Kids Think Design—A Kids Design Collaborative Project](#)

NATIONAL STANDARDS

[Computer Science Teachers' Association \(CSTA\)](#)

6 Collaboration (CL)

Apply productivity/multimedia tools and peripherals to group collaboration and support learning throughout the curriculum.

Collaboratively design, develop, publish and present products (e.g., videos, podcasts, websites) using technology resources that demonstrate and communicate curriculum concepts.

Works Cited

¹ Ahern, Karla and Naomi Keller. "Career Paths in Marketing Research." 2017. American Marketing Association. <https://www.ama.org/career/Pages/-Career-Paths-in-Marketing-Research.aspx>.

² U.S. Bureau of Labor Statistics. "Occupational Outlook Handbook: Biomedical Engineers." December 17, 2015. <https://www.bls.gov/ooh/architecture-and-engineering/biomedical-engineers.htm>.

³ U.S. Bureau of Labor Statistics. "Occupational Outlook Handbook: Industrial Designers." December 17, 2015. <https://www.bls.gov/ooh/arts-and-design/industrial-designers.htm>.

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Wavelength Aura

Open the Aurasma app and enter Username **DEClassroom**.

Aim the camera at the wavelength image.

An image of a person listening will appear.



Siemens STEM Day

SiemensStemDay.com

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HEADPHONE CHALLENGE WORKSHEET

Background

SonicSolutions, Inc. is one of the world's leading audio technology companies. The company wants to expand their product line in a new direction by manufacturing a pair of headphones specifically for children under three. This is a new audience for the company, and they are not familiar with the wants and needs that young children have for headphones. The board of SonicSolutions, Inc. has invited expert teams of professionals to research and design a pair of toddler-friendly headphones. The team with the best design will win a huge contract with the company. Your team, composed of one market researcher, one biomedical engineer and one industrial designer has been invited to submit a design.

Activity

Your team must do the following:

1. Educate the company on what toddlers and their parents want and need from a pair of headphones
2. Give the company a brief summary of how the human ear works and why a child's ears are different from the ears of an adult
3. Present an exciting design for a pair of toddler headphones

Follow these instructions:

1. Assign one of the roles below to each member of your team
2. Have each member complete the activity listed under their respective role
3. Compile all of the research and work your group has completed in the individual activities into a presentation using the Aurasma app
4. Make the presentation exciting and informative and 60 seconds or less
5. Explain to the board of SonicSolutions, Inc. (played by your classmates) why your team is the best team for the job

The board will "vote" for the best team by scoring the presentations on the Headphone Challenge Rubric. May the best team win!

Roles

Market Researcher

Use your internet-enabled device to research and answer the following questions (remember to name your sources!):

1. Are similar headphone products currently on sale?
2. What do parents want and need from this product? What do kids want and need from this product?
3. What is one way you can make your product unique?
4. What should you name your product?

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Biomedical Engineer

Find, draw or take a photograph of an ear. Using your internet-enabled device, research the different parts of the ear and write them on your image (if you take a photo, you can use an app like Snapchat to write on your image).

Industrial Designer

Draw a pair of headphones that you think will be appealing to toddlers and their parents. Use the information gathered by your teammates on market needs and anatomy in order to modify your design.

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HEADPHONE CHALLENGE RUBRIC

Rate each team on the following categories, each on a scale of 0-5. On this scale, 0 means the team did not address this need or concern. 5 means that the team addresses the need or concern exceptionally well.

Need/Concern	0	1	2	3	4	5
Does the team understand the needs of the consumer?						
Does the team know what similar products currently exist?						
Is the product new and innovative?						
Does the team understand the physiology of the human ear?						
Does the team incorporate their knowledge of the human ear into their product design?						
Is the product design fun and attractive?						
Is the team's "pitch" fun and engaging?						
Did the team's pitch do a good job of using the Aurasma technology?						

Total Points: _____ / 40