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iBIO STEM Kits: Build a Better Bandage

iBIO STEM Kits welcomes you to a SCIENTIFIC JOURNEY!

This kit contains the materials you will need to build a better bandage. The purpose of this kit is to challenge you to learn about bandages by evaluating some commercial bandages for how well they do their job. Once you have a good idea for how bandages can be improved, we are challenging you to engineer a better bandage as a scientist. What does this mean?

Scientific exploration is different than just playing around because it asks you to think about HOW you investigate. This means you need to do your investigation by observing what happens when you change an element of your design that you have carefully chosen. Good observation will help you to understand WHY something happens. Scientific exploration also means that you record WHAT you see or measure so that you can alter your design based upon what works for you. The STEM Kit Notebook you received will help to guide your investigation and give you a place to record your observations, create your design and document your changes.

Follow the QR code at the top of the page for additional resources on this activity. There are many resources for you to use on our website. This type of investigation is associated with some very exciting careers! We hope that you will explore these resources while you are doing your investigation!

Let's Get Started!

FIRST, you will need to prepare your workspace. Having a clear space where you can see all of your materials and tools is very helpful. A kitchen table will work nicely. To make your clean up easier, you should protect your surface by laying out some used newspaper or opening up a paper grocery bag.

SECOND, you want to unpack your materials. Use the list below to identify which materials are used in each part and organize them in your workspace.

Kit Materials for Part A: 4 different types of commercial bandages	Kit Materials for Part B and Part C: Gauze Medical Tape Waxed Paper Instant Coffee Packet Sandwich bag Knuckle Bandage
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General Supplies: A bowl or container that you can use to hold liquid Scissors Paper Hand soap and Water Dirt or cocoa powder	
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LAST, you need to be prepared for experimenting safely. Use caution with your scissors and use only room temperature liquids when evaluating your bandages.



Building a Better Bandage-Engineering

Adapted from Science Scope, Everyday Engineering, "It's Stuck on You" by Richard H. Moyer and Susan A. Everett

Part A: EXPLORE: How do different bandages compare?

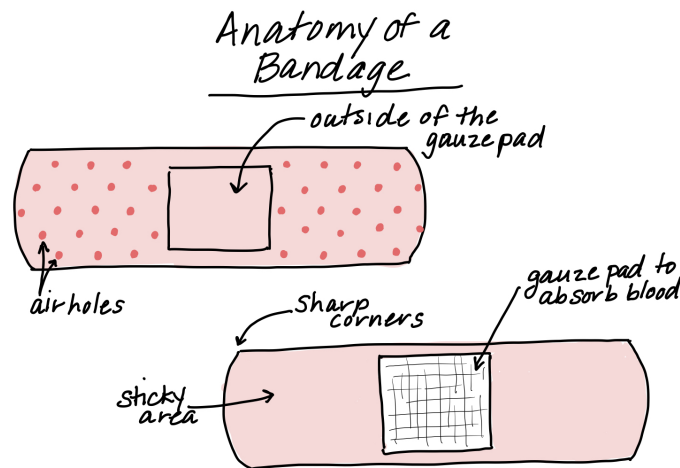
Here's what you need from your STEM Kit:

Instant Coffee Packet
 One of each type of bandage
(plastic, fabric, "waterproof"... and any others you find interesting and want to test. Do NOT use the knuckle bandages, we will be using them in Part C.)

General Supplies:

1. A bowl
2. Dirt or cocoa powder
3. Hand soap
4. Water

In order to make a good bandage design, you first need to examine the designs of bandages and decide what features are the most important. What are the features that make the best bandage? You will be testing them out! Remember, a scientific investigation ensures that the test for each bandage is EXACTLY THE SAME. Apply the same criteria to each bandage. This ensures that our results are reliable so that you can trust your results.



Read through the list below. Choose the features you want to test and come up with some of your own. If you have the boxes for the bandages, test the claims that are on the boxes.

- | | | |
|------------------------|---------------------|----------------------|
| OVERALL SHAPE | SIZE OF GAUZE | AIR FLOW |
| MATERIAL USED FOR TAPE | STRETCHINESS | WATERPROOFING |
| STICKINESS OF TAPE | TEXTURE | DURABILITY |
| STICKIEST LOCATIONS | ABSORBENCY OF GAUZE | PROTECTION FROM DIRT |



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Use one data chart for each bandage you test. Once you have decided what features you want to test, write the features in the space provided in your data chart. If you are making your own data chart, the suggested design is shown to the right.

Observations:

Many features will need you to observe. How do you do this? You use your senses.

- You may **TOUCH**.
- Maybe you will simply **LOOK** at it.
- Some features will need to be **SMELLED**.
- Can you think of a feature that you will **LISTEN** to?
- But.....**NO TASTING** please!

Apply the bandage on the back of your hand. Inspect the bandage. Record your observations and rating.

Rating Scale:

You will be judging each of the bandages using a scale from 1 to 5.

A rating of 1 means that the feature has a terrible design. It makes the bandage a **BAD** choice.

A rating of 5 means that it has a terrific design. This is the **BEST** design for this feature.

Using a rating scale can be tricky. You will have to decide on which rating you will give each type of bandage. You should also explain **WHY** you have chosen the rating.

Some features need to be tested. Here are some testing suggestions, but you can design your own!

To test waterproofing: (Save your materials)

Mix together the Instant Coffee and water. Put 1/2 cup of dark liquid in a bowl. Dunk or soak the hand with the bandage in the bowl. Think about how long you should hold your hand in the liquid. Should you move it around? How do you remove the bandage so that it is a fair test? Inspect the condition of the bandage. If the gauze is tinted brown, it is not waterproof. Record your observations and rating.

To test stickiness:

Wash the hand with the bandage for 20 seconds using hand soap. After drying, remove the bandage. How do you remove the bandage so that it is a fair test? inspect the condition of the bandage. Record your observations and rating.

To test absorbency:

Add water, one drop at a time, to the gauze. Count how many drops of liquid are absorbed into the gauze before it stops holding all of the liquid.

To test protection from dirt:

Get some dirt or cocoa powder. Rub the hand with the bandage with the material. How do you remove the bandage so that it is a fair test? Inspect the condition of the bandage. Record your observations and rating.



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Bandage 1 Brand and Type	Feature	Observations about a Feature	Rating 1-worst 5-best	Explain why you gave it the rating
	Example: Overall Shape	Rectangle with curved ends	4	The corners at the edges don't seem to stick very well.
Evaluate: What are the best design features for this bandage?				
Evaluate: What improvements does it need?				



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Bandage 2 Brand and Type	Feature	Observations about a Feature	Rating 1-worst 5-best	Explain why you gave it the rating
	Example: Overall Shape	Rectangle with curved ends	4	The corners at the edges don't seem to stick very well.
Evaluate: What are the best design features for this bandage?				
Evaluate: What improvements does it need?				



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Bandage 3 Brand and Type	Feature	Observations about a Feature	Rating 1-worst 5-best	Explain why you gave it the rating
	Example: Overall Shape	Rectangle with curved ends	4	The corners at the edges don't seem to stick very well.
Evaluate: What are the best design features for this bandage?				
Evaluate: What improvements does it need?				



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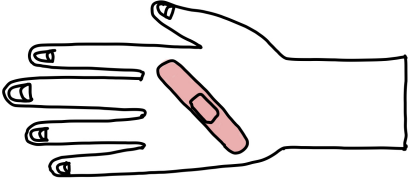


Part B: ENGINEER - Design and make a waterproof bandage that WORKS!

<p>Here's what you need from your STEM Kit:</p> <ol style="list-style-type: none"> 1. Gauze 2. Medical Tape 3. Waxed Paper 4. Sandwich Bag 5. Paper 6. Instant Coffee Packet 	<p>General Supplies: (Reuse materials from Part A)</p> <ol style="list-style-type: none"> 1. A bowl 2. Dirt or cocoa powder 3. Hand soap 4. Scissors 5. Water
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DESIGN:

1. Use what you have learned to design a waterproof bandage to use on the back of your hand.
2. Make a design plan in your journal with a sketch of your design for the waterproof bandage.
3. Use the materials to build your bandage design!



BUILD: Use the materials to build your design.

TEST:

4. Use the data chart on the next page of this journal for your new bandage design.
5. Test your design, using the SAME Features and rating scale that you used for Part A.
6. If you did not test waterproofing in Part A, add it to your testing procedure. Test your bandage for waterproofing.

DESIGN PLAN

<p>Ask: What is the problem you need to solve?</p>	<p>Plan: What will your design look like? Draw a labeled diagram and write down your materials with the amount you need:</p>
<p>Imagine: What are your ideas for solving this problem?</p> <ol style="list-style-type: none"> 1. 2. 3. 	



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Your Bandage Design	Feature	Observations about a Feature	Rating 1-worst 5-best	Explain why you gave it the rating
Evaluate: What are the best design features for this bandage?				
Evaluate: What improvements does it need?				



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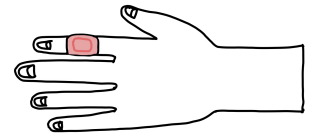


Part C: Re-Engineer - Redesign your waterproof bandage for a KNUCKLE!

<p>Here's what you need from your STEM Kit:</p> <ol style="list-style-type: none"> 1. Gauze 2. Medical Tape 3. Waxed Paper 4. Sandwich Bag 5. Paper 6. Instant Coffee Packet 	<p>General Supplies: (Reuse materials from Part A)</p> <ol style="list-style-type: none"> 1. A bowl 2. Dirt or cocoa powder 3. Hand soap 4. Scissors 5. Water
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DESIGN:

1. Use what you have learned to design a waterproof bandage to use on the middle knuckle of your index finger.
2. Make a new design plan in your journal with a sketch of your design for the waterproof knuckle bandage.
3. Use the materials to build your knuckle bandage design!



BUILD: Use the materials to build your revised design.

TEST:

4. Use the data chart on the next page of this journal for your knuckle bandage design.
5. Test your design, using the SAME Features and rating scale that you used for Part A.
6. If you did not test waterproofing in Part A, add it to your testing procedure. Test your bandage for waterproofing.

DESIGN PLAN

<p>Ask: What is the problem you need to solve?</p>	<p>Plan: What will your design look like? Draw a labeled diagram and write down your materials with the amount you need:</p>
<p>Imagine: What are your ideas for solving this problem?</p> <ol style="list-style-type: none"> 1. 2. 3. 	



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Your Knuckle Bandage Design	Feature	Observations about a Feature	Rating 1-worst 5-best	Explain why you gave it the rating
Evaluate: What are the best design features for this bandage?				
Evaluate: What improvements does it need?				