

Would You Buy That?



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General Description

Type of program:

Stage presentation

Like all new technologies, nanotechnology has costs, risks, and benefits we cannot always predict. The **Would You Buy That?** stage presentation examines and explores ways our consumer behavior both impacts and is impacted by new technology. By looking at historical examples and current and future nanotechnologies, audience members weigh the risks versus the benefits and make group purchase decisions. Sometimes we need to stop and think more about a consumer decision. By engaging in this dynamic, interactive presentation, the audience and the presenter discuss their choices and learn more about nano products they could buy (or not buy) for themselves, their families, and their communities.

Program Objectives

NISE Network content map main concepts:

As a result of participating in this program, visitors learn that:

1. Nanoscale things are very small, and often behave differently than larger things do.
2. Scientists and engineers have formed the interdisciplinary field of nanotechnology by investigating properties and manipulating matter at the nanoscale.
3. Nanoscale science, engineering, and technology lead to new knowledge and innovations that weren't possible before.
4. Nanotechnologies have costs, risks, and benefits that affect our lives in ways we cannot always predict.

National Science Education Standards:

2. Physical Science

K-4: Properties of objects and materials

5-8: Properties and changes of properties in matter

9-12: Structure and properties of matter

5. Science and Technology

K-4: Abilities of technological design

K-4: Understanding about science and technology

5-8: Abilities of technological design

5-8: Understanding about science and technology

9-12: Abilities of technological design

9-12: Understanding about science and technology

6. Personal and Social Perspectives

K-4: Science and technology in local challenges

5-8: Risks and benefits

9-12: Natural and human-induced hazards

9-12: Science and technology in local, national, and global challenges

7. History and Nature of Science

K-4: Science as a human endeavor

5-8: Science as a human endeavor

Table of Contents

General Description.....	1
Program Objectives	1
Table of Contents	3
Time Required	4
Background Information	4
Definition of terms	4
Materials	5
Setup	5
Program Delivery.....	5
Safety	5
Talking points and procedure.....	5
Tips and troubleshooting	15
Common visitor questions	15
Going further.....	15
Cleanup.....	15
Universal Design	16

Time Required

Setup	Program	Cleanup
5 minutes	40 minutes	5 minutes

Background Information

Definition of terms

Nano is the scientific term meaning one-billionth ($1/1,000,000,000$). It comes from a Greek word meaning “dwarf.”

A nanometer is one one-billionth of a meter. One inch equals 25.4 million nanometers. A sheet of paper is about 100,000 nanometers thick. A human hair measures roughly 50,000 to 100,000 nanometers across. Your fingernails grow one nanometer every second.

(Other units can also be divided by one billion. A single blink of an eye is about one-billionth of a year. An eyeblink is to a year what a nanometer is to a yardstick.)

Nanoscale refers to measurements of 1-100 nanometers. A virus is about 70 nm long. A cell membrane is about 9 nm thick. Ten hydrogen atoms are about 1 nm.

At the nanoscale, many common materials exhibit unusual properties, such as remarkably lower resistance to electricity, or faster chemical reactions.

Nanotechnology is the manipulation of material at the nanoscale to take advantage of these properties. This often means working with individual molecules.

Nanoscience, nanoengineering, and other such terms refer to those activities applied to the nanoscale. “Nano,” by itself, is often used as shorthand to refer to any or all of these activities.

Materials

The materials for this program are all included in the NanoDays 2014 kit:

- Slides
- Labeled shopping bags (red, orange, green)
- Historical product cards
- Nanotechnology product cards
- Sugar substitute packets

Setup

Time

5 minutes

Prepare and set up the materials:

- Be sure the slides are visible to the audience
- Place the shopping bags in a location where the audience can see them
- Have the product cards and sugar substitute packets handy to use and distribute during the program

Program Delivery

Time

40 minutes

Safety

The sugar substitute packets are meant to be a prop for the presentation. Remember to remind visitors that they are NOT meant to be eaten and to return them after the presentation.

Talking points and procedure

Slide 1:

Hello everyone. Welcome! Thanks for coming to play ***Would You Buy That?*** So, who is ready to play—everyone now, say it with me!—

WOULD. YOU. BUY. THAT?

Awesome! Raise your hand if you bought something today? Do you think that you will buy something tomorrow?

I have many interesting products here with me today. Some may look familiar to you and some may not.

(Show a few product cards)

We are consumers. We buy and use things every day to help make our lives easier. People have been creating new products for centuries. Innovations include things like the wheel, light bulbs,

microwave ovens, and electric toothbrushes! New products come on the market every day that are meant to improve our lives. However, with new products there can be costs or risks we cannot always predict. And before we buy something, we want to learn about these risks so we can make the best choices.

Hopefully by playing ***Would You Buy That?*** today, you can start thinking about some of the costs, risks and rewards of new technologies! Are you ready to play? Say it out loud with me!

Slide 2:

WOULD. YOU. BUY. THAT?

Exploring the risks and rewards of new technologies and finding a healthy balance is key to being informed consumers! Playing ***Would You Buy That?*** today won't cost you a penny. That's because knowledge is free. You, the audience, are going to learn about some consumer products and then you, the audience, will have a chance to weigh in and decide to—

Slide 3:

"Buy it" OR you may decide to—

Slide 4:

"Think about it," and ask questions. You may find that you want to learn more about some products. You might decide that some products are beneficial to certain groups of people, but not everyone. Or you could decide that not enough research has been done on a particular product, so you're not confident enough to buy it, though you may change your mind in the future.

Slide 5:

Lastly, you could decide that we **"Better not"** buy the product and put the product right back on the shelf.

Slide 6:

OK, so the choices are: Buy it, Think about it, and Better not.

Slide 7:

Raise your hand if you're ready to play ROUND ONE of ***WOULD. YOU. BUY. THAT?*** Remember, people have been making new products for centuries. For this first round, we are going to go back and take a look at some of the benefits, some of the risks, and some of the controversies that these historical products presented to consumers.

Slide 8: (hold up card with lead plumbing)

Who likes indoor plumbing? Toilets and showers? What about utensils like forks and spoons?

(Audience responds to each question)

This is a picture of lead plumbing at an archaeological dig in Italy. Lead was a popular material in plumbing and dishes for the Ancient Romans. It is very flexible, durable and easy to work with, and the Romans had lots of it. What do you think, contestants? Would you buy plumbing or dishes made with lead?

(Audience responds. If they respond "better not," ask why. Item card is placed/moved into respective "buy it," "think about it," "better not" bags.)

Let's explore lead a little more closely. While lead is very flexible and durable, it is also highly toxic. Lead poisoning can cause nerve damage, interrupt cell production, and damage major organs. It took the Ancient Romans a long time to connect their lead use and all of those bad side effects. Lead use in certain products is now banned in many countries all over the world! What do you think now, contestants? Audience, help me here...**Would you buy that?**

(Audience responds. If they respond "better not," ask why. Item card is placed/moved into respective "buy it," "think about it," "better not" bags.)

Slide 9: (hold up card with penicillin)

Great, let's move on to our next product.

Raise your hand if you've ever taken an antibiotic drug call penicillin? How about if you know someone who has taken penicillin?

(Audience raises hands)

Penicillin's ability to cure people of many once-fatal bacterial infections has saved many, many lives. It's even been called a "miracle drug." But did you know that penicillin was originally discovered in common air and dust mold? (By Scottish scientist and Nobel laureate Alexander Fleming?) The medicinal antibacterial uses of penicillin were later discovered through further research and experimentation by German, Austrian, and English researchers. Before it could be sold, it went through safety trials to be sure it was safe and effective.

What about you audience? **Would you buy that?**

(Audience responds. Item card is placed/moved into respective "buy it," "think about it," "better not" bags.)

Slide 10: (hold up card with frying pan)

Who likes pancakes? Or what about eggs? Scrambled or over easy? Those food items are easier to cook, all thanks to pans like this! Does anyone have a pan like this at home?

Pans like this have a special coating applied to them. This allows the surface to be nonstick, making cooking and cleaning up an easier task. It can also be healthier as you don't need as much butter or oil in the pan before you cook. But pans that have nonstick coating come with some warnings from the EPA, or Environmental Protection Agency. Toxic chemicals used in creating this nonstick substance have been found in lakes and rivers. Knowing that this pan may pose a danger to the consumer or to the environment, do you want to "Buy it," "Think about it," or "Better not" and put it back?

(Audience responds. If they respond "better not" ask why. Place item card into respective "buy it," "think about it," "better not" bags.)

Slide 11: (hold up card with artificial sweetener packet image, and toss out a few packets of sweetener to the audience)

I would like audience members who have a packet of sweetener to look for a warning label. (BUT DON'T EAT THE SWEETENER, IT'S A PROP!) For those of you NOT holding packets, let me tell you something about this sugar substitute. It was all the rage during World War II. During that war there were shortages of many staple goods like sugar, so scientists created saccharin in the lab.

How many of you have used a packet of saccharin like this? How many of you might in the future? What do you think contestants...**Would you buy that?**

(Audience responds. If they respond "buy it" or "better not" ask why. Place item card into respective "buy it," "think about it," "better not" bags.)

Wait! Before we make a decision, did anyone holding a saccharin packet find a warning label? Before the 21st century you would have seen a message that told consumers that saccharin is a cancer-causing chemical in lab animals and possibly humans. Well, consumers today are no longer warned of this on the packet. Please start passing those packets back up to the front.

(Collect sweetener packets from audience)

The United States National Toxicology Program, or USNTP, removed saccharin from its list of cancer-causing substances in 2000. After 40 years, the USNTP believes that saccharin is safe for human consumption. So what now, audience? Which bag do you think this product belongs in?

(Audience responds. Item card is placed/moved into respective "buy it," "think about it," "better not" bags.)

Slide 12:

Okay, let's check in with our bags. Is everyone happy with what was bought? Or what was not bought? After learning a little bit more about each item, would anyone like to make any returns? Why?

*(Audience responds. **Discuss responses with audience.** Item cards are placed/moved into respective "buy it," "think about it," "better not" bags based on audience responses.)*

Good first round. Give yourselves a round of applause! It is important to think and talk about all these different products. Even if it seems like old news, like with lead and asbestos, or something that has been questioned more recently, like nonstick pans or saccharin. Do you think it's important to ask questions and weigh the risks and benefits before we buy them?

(Audience responds)

Slide 13:

Great, now let's get ready for round 2. Before we introduce our first product, I have a question for you. How many of you have heard of nanotechnology, or nano anything?

(Audience responds)

Great! In the field of nanotechnology, scientists and engineers make new materials and tiny devices. Sometimes they build things out of individual atoms! It sounds like science fiction, doesn't it? But nanotechnology is very real. It will affect all of our lives.

Some say new nanotechnologies will have a greater impact than any previous invention—more than electricity, more than cars, more than television, more than computers, even more than the Internet! So we should all be paying attention to nanotechnology.

Slide 14:

Nano is a prefix, like mega or micro. You've probably heard of megabytes or microscopes. Nano basically means super small.

In nanotechnology, researchers measure things using nanometers. A nanometer is a billionth of a meter. That's very, very, very small!

This 6-year-old girl is about one meter tall—that's a billion nanometers.

The picture in the middle is of a red blood cell. A red blood cell is about a millionth of a meter, or one micrometer across. That's pretty small, but a nanometer is a thousand times smaller than that.

The picture on the right is a DNA molecule. DNA is found in your cells. A DNA molecule is two nanometers wide. That's two-billionths of a meter!

Slide 15:

Nanotechnology might also help us to create innovations we can hardly imagine today. Some scientists think nanotechnology might allow us to create an elevator to space! Tiny carbon nanotubes are super strong for their size, so they could be used to create a cable between a base station on earth and an anchor in space.

Another possibility is quantum computers. Researchers are working on ways we might be able to greatly increase computer memory and processing power by using quantum bits, rather than our current binary system.

Just like other technologies, nanotechnology has potential to provide great benefits, but we also have to think about potential risks and how to protect ourselves.

Slide 16:

As individuals and as a society, we need to think about the kind of future we want and how nanotechnology will be part of it.

Nanotechnology is already part of our lives, and it will become even more important in the future. Everyone has a role in shaping nanotechnology. Companies and governments decide which technologies to invest in and how to regulate them. And individuals can help shape nano research and development by deciding whether to buy or use products containing nanotechnology.

You're already making decisions about whether or not to use nanotechnologies, though you may not always know it.

Slide 17:

OK, raise your hand if you're ready for ROUND TWO of **WOULD. YOU. BUY. THAT?**

Slide 18: (hold up card with Benny the Bear)

These first couple of products have nano-sized particles of silver in them. Nano-sized silver particles are one of the most common nanomaterials used in consumer products. Has anyone here ever used silverware made out of real silver?

(Audience responds)

In the Middle Ages people made silverware out of silver. Perhaps they somehow knew that silver is a natural antimicrobial. Tiny nano-sized particles are especially effective at killing germs. However, nano-sized silver is so small it can't be caught in standard filters and could enter our environment by accident. We don't, yet, know how big an impact that nano-silver will have once it enters the environment, and some studies show that there could be unexpected or unwanted consequences.

So what do you think? Would you consider buying a stuffed animal made with nanosized silver? Nanosilver keeps this bear free of mold, bacteria, and dust mites, which makes it safer for children with asthma and allergies. Have any of you heard of the lung disease asthma? Does anyone here suffer from asthma?

(Audience responds)

Some kids who have asthma may not be able to have regular stuffed animals because of dust and mites. There are also kids in hospitals who can't have contact with any bacteria due to illness.

This all sounds great, and there are no scientific studies that say nanosilver is unsafe for humans. But when questioned about the safety of children, the company that makes Benny decided to avoid controversy and stop advertising that they use nanosilver particles. New versions of Benny actually use chemical pesticides instead of nanoparticles.

So, what do you think? Would you "buy" nanosilver stuffed animals for everyone? What about "think about it," asking questions and making nanosilver stuffed animals available to specific people but not to everyone? Do you think the government should control who can buy it, since the nanosilver could affect the environment, which is shared by everyone? Or should we put it right back on the shelf with the "better not" bag?

(Audience responds. Item card is placed into respective "buy it," "think about it," "better not" bag.)

Slide 19: (hold up card with toothbrush)

There have been many innovations in the dental world. We've invented toothpaste, electric toothbrushes, mouthwash! What about a special nanosilver toothbrush? Do you think we need a nanosilver toothbrush, too, to help keep our teeth clean and our breath fresh? Do we want to "buy it," "think about it" or put it in our "better not" bag?

(Audience responds. Item card is placed/moved into respective "buy it," "think about it," "better not" bags.)

Slide 20:

OK, now we're going to look at some other products that use different kinds of nanotechnology. Raise your hand if you're ready for ROUND THREE of **WOULD. YOU. BUY. THAT?**

Slide 21: (hold up image of tea bag water filter)

This little water filter can be stuffed into the neck of an ordinary water bottle to clean water and make it safe to drink. The tea bag filter is effective at cleaning water because it is coated with nano-sized antimicrobial fibers and filled with activated charcoal. The fibers and charcoal trap and kill harmful bacteria and toxic chemicals.

Each filter costs less than five cents, and can produce one liter of clean water. It is probably especially useful for people in developing countries where clean drinking water is hard to come by. Here, a researcher from the South African lab that developed this neat technology shows one used and one unused filter.

Should we “buy it”? Or “think about it” and only make it available to people who really need it? Or are we saying, no way, “better not,” and putting it right back?

(Audience responds. If they respond “better not,” ask why. Item card is placed/moved into respective “buy it,” “think about it,” “better not” bags.)

Slide 22: (hold up image of sunblock)

Sunblocks are one of the most common products containing nanotechnology. Many sunblocks contain nano-sized particles of zinc oxide or titanium dioxide to protect skin from the sun’s rays. While older products left a visible white film, sunblocks with nanoparticles are transparent. You may have noticed that I keep saying sunBLOCK—that’s because I’m only talking about protection creams that physically block the sun. Most sunSCREEN uses chemicals to keep harmful rays from hurting your skin.

While we know that nanoparticles of silver can affect the bacteria populations in an ecosystem, it’s not as clear what effects really tiny, nano-sized particles of zinc oxide or titanium dioxide particles would have. How would they affect fish and other wildlife? We also do not understand all the effects that these particles could have on our own health. What if these nanoparticles are so small that they could go *inside* our own cells. What would happen? Scientists are currently working to answer questions like this.

Because nanoparticles are regulated in the same way as any other size materials, companies don’t have to tell you if their sunblock contains nanotechnology. What do you think? Are you happy to “buy it”? Do you want to “think about it” and learn more, or should we “better not” and put it back on the shelf?

(Audience responds. If they respond, “better not” ask why. Item card is placed/moved into respective “buy it,” “think about it,” “better not” bags.)

Slide 23: (hold up image liquid body armor)

Now for the last product in ROUND THREE!

Researchers have developed a new material, Liquid Body Armor, by combining traditional Kevlar—a protective fabric commonly used by police officers and soldiers—with special tiny nanoparticles. Because the particles are so small, the material is comfortable, lightweight, and flexible. When the protective gear is forcefully hit, the energy of the sudden impact causes the nanoparticles to quickly clump or tangle together. The material becomes super strong in milliseconds, and then quickly returns to its original flexibility. This is important, because it means that when the material is not being hit it is easy to move around in. There are all sorts of possible uses for this kind of technology. Can you think of any?

(Audience responds)

Awesome! Materials like Liquid Body Armor could be used to make military or police uniforms, or football pads. They're even being used to make fashionable ski hats that protect you as well as a hard, plastic ski helmet out on the slopes! We can already buy some of these products, and more are coming. One thing to consider is that these products are probably more expensive than the traditional alternative and we don't know everything about how these tiny particles interact with the environment and our bodies. Given the choice, would you "buy it"? Do you want to "think more about it"? Or "better not"?

(Audience responds. If they respond "better not," ask why. Item card is placed/moved into respective "buy it," "think about it," "better not" bag.)

Slide 24:

Alright! Nice work everyone. Let's have another round of applause! How do our bags look? What products did we buy? What didn't we buy?

Buying products. Not buying products. Waiting to purchase new technologies. These are all choices that we can make every day. Some choices may affect just one person like using sunblock made with nanoparticles. And some choices may affect society as a whole. For example, washing machines that use silver nanoparticles may cause silver nanoparticles to enter nearby ecosystems, like rivers or lakes. We vote on what products are made and how they are labeled every time we buy something. Hopefully playing **Would You Buy That?** has given you a chance to consider the risks and benefits of each product that we've discussed.

Slide 25:

It's important to remember that many technologies can be viewed as either good or risky, depending on the circumstances. Let's consider fire, one of the oldest technologies. Fire is useful when we want to get warm or cook our food. But fire can also burn us or cause damage to our houses.

We have to think ahead and protect ourselves from the risks related to any technology. For example, we build fires in a safe place, we have a fire extinguisher or water handy, and we have fire fighters to respond if a fire gets out of control.

Nanotechnology is already part of our lives, and it will become even more important in the future. So as individuals and as a society, we need to think about the kind of future we want and how nanotechnology will be part of it.

Just like other technologies, nanotechnology has the potential to provide great benefits, but we also have to think about potential risks and how to protect ourselves.

Slide 26:

Remember, everyone has a role in shaping nanotechnology. Companies and governments

decide which technologies to invest in and how to regulate them. Individuals can help shape nano research and development by deciding whether to use products containing nanotechnology.

You're *already* making decisions about whether or not to use nanotechnologies, though you may not always know it. Educating ourselves as consumers will help us make the right decisions for our families, our community, and ourselves.

Slide 27:

And the best way to be good consumers is to ask questions and learn. To learn more about nanotechnology, you can start here:

www.WhatIsNano.org

Be a good consumer. With knowledge we ALL win!

Slide 28:

Thanks so much for playing! If you have any questions, I will be happy to try and answer them for you. Have a wonderful day!

Tips and troubleshooting

To make this program entertaining, it's important that the presenter—*or game show host*—have high energy. Make the questions exciting for the audience, and give them time to really think about and make decisions about what to buy or not buy!

It's fine to read the script directly off the slide notes or a printout, so long as you can do this smoothly and with enthusiasm. Audiences are used to seeing game show hosts reading the questions.

If your institution uses Clickers or Classroom Response Devices, this program can easily be adapted to accommodate audience participation. It is, however, still important to encourage group discussion and deliberation.

If you have trouble keeping your shopping bags upright, try adding a short stack of office paper to the bottom of each bag or crumpling some paper and stuffing the bag to make them more sturdy.

Common visitor questions

Do all these nano products exist today?

All the nanotechnologies presented in this program have been developed. But some, such as Liquid Body Armor, are not yet commercially available in all their different forms. Benny the Bear is an example of a product that is no longer available for sale, but the nanotechnologies that enabled it are still being used.

Going further...

The Project on Emerging Nanotechnologies has an inventory of consumer products that contain nanotechnologies: nanotechproject.org

The NISE Net has a website with information, videos, audio pod casts, and activities for the public: whatisnano.org

NISE Net has a website with additional resources for professional audiences: nisenet.org

Cleanup

Time

5 minutes

Gather and store the materials.

Universal Design

This program has been designed to be inclusive of visitors, including visitors of different ages, backgrounds, and different physical and cognitive abilities.

The following features of the program's design make it accessible:

1. Repeat and reinforce main ideas and concepts
 - The presentation is organized into discrete chunks.
 - A content overview is provided at the beginning of the program (program outline), and the audience choices are summarized between each section and at the end of the program.
2. Provide multiple entry points and multiple ways of engagement
 - Concise key phrases are used to support main ideas.
 - Main ideas are presented through multiple senses (sight and hearing).
3. Provide physical and sensory access to all aspects of the program
 - Main ideas are presented through multiple senses (sight and hearing).
 - Slides are made accessible by using large, high-contrast text and images and by using large, clear fonts. Additional information is available on cards that can be shared after the program.

To give an inclusive presentation of this program:

- Make sure your face is visible at all times.
- Make sure you don't stand in the way of the slides or the bags on the table.
- Ask the audience questions, and check in with them along the way to make sure they're engaged and following you. Give the audience plenty of time to discuss their choices.
- Use descriptive language when presenting objects and images.
- Make a handout of the presentation available to visitors, either to use during the presentation or to take home.
- Make sure your audience knows about any special accommodations you offer.



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