

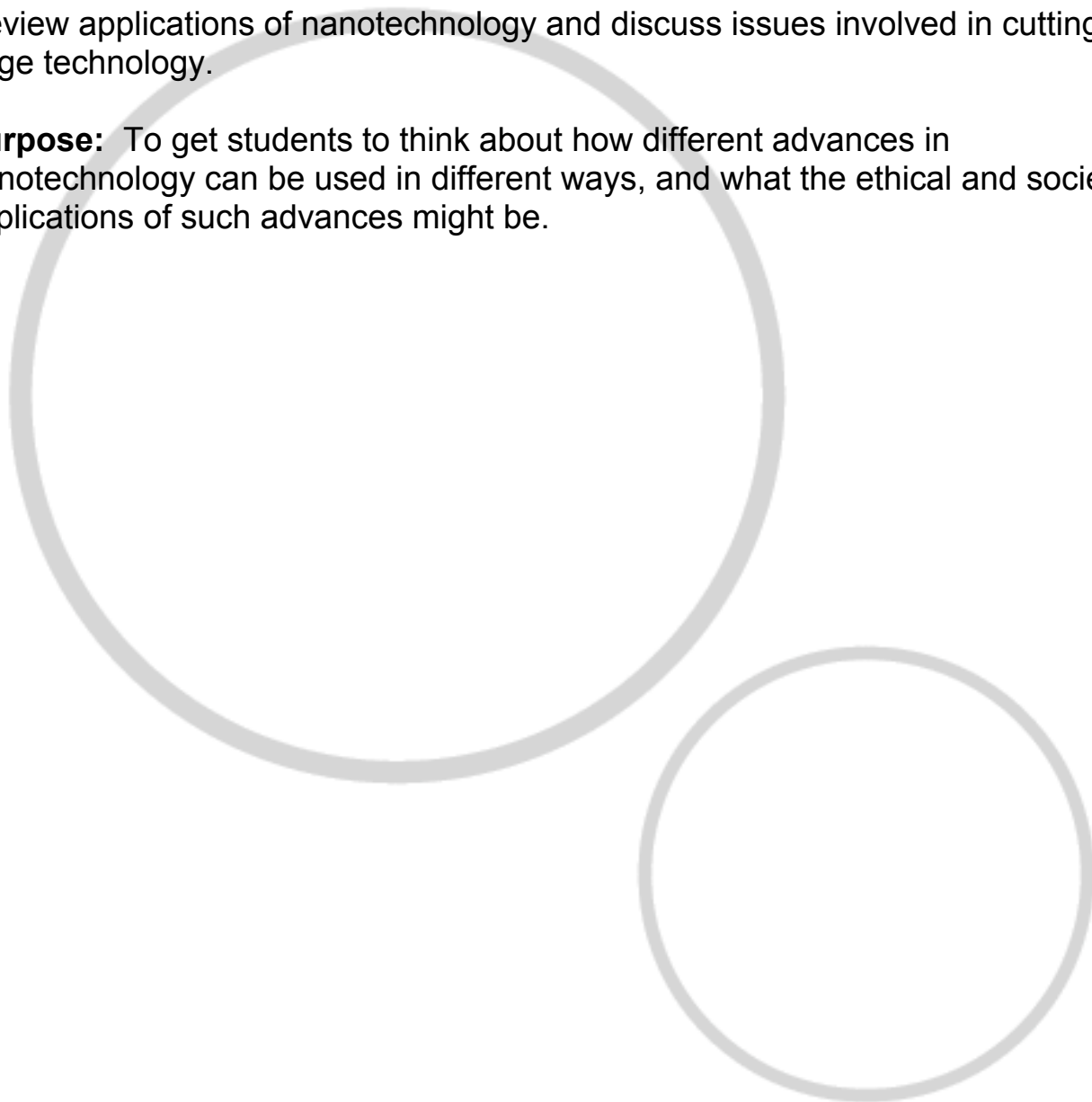


Activity Strand: NanoApplications **Post-Visit**

Overview:

Review applications of nanotechnology and discuss issues involved in cutting edge technology.

Purpose: To get students to think about how different advances in nanotechnology can be used in different ways, and what the ethical and societal implications of such advances might be.



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Activity I: Worksheet

Materials:

Applications worksheet

Estimated time:

15 minutes

What to do:

Students classify various research/advances in nanotechnology as one or more of the following: basic technology, consumer technology, medical technology, military technology, etc.

Basic Technology: technology used in the manufacture of other things including wires, gears, structural pieces, etc.

Consumer Technology: things for people to buy including clothes, electronics, cleaning supplies, etc.

Medical Technology: things used to cure disease or treat the sick or injured, including medicines, biocapsule, cancer-detecting wire, quantum dots, etc.

Military Technology: technology for military security, defense, and attack, including weapons, biochemical detection systems, smart dust, etc.

Extension:

See Activity II





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Activity II: Discussion

Estimated time:

25 minutes

What to do:

As a class, discuss the importance of doing research and developing products in each of the different categories. Talk about the impact of different categories on society. Ask students to present arguments about why pursuing research in one category is more important than another, and why a particular category should or should not be a major focus of research.

Variation/Extension:

Make this a writing assignment that asks students to address the ideas above.

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Activity III: Town Hall

Estimated time:

2–4 hours

What to do:

Choose a category of application, or a specific product—the more controversial the better. Assign or have students pick roles to play (opponents, proponents, etc). Hold a Town Hall meeting where students present their case for why such research should or should not be conducted in their area, funded or not, etc.

Opponents: individuals or organizations against the proposed research

Proponents: individuals or organizations in favor of proposed research

Industry: representatives of companies that will produce, market or in some way profit from the research/application (also likely proponents)

Citizens: people for and against research—could have relatives whom research might benefit or whom similar applications have hurt, could be concerned about environmental impact, traffic, resources, jobs, etc.

Officials: members of the government or agency (city council, EPA, etc.) or public servants (police, firefighters, etc.) for or against the research

Explain that a town meeting is an opportunity for government officials and residents of a town or other community to come together and share viewpoints about an issue that concerns the community. On small pieces of paper, write the various roles for students to play, and place the pieces in a box or bag. Direct students to draw out pieces that will identify their roles. Make a list with students' names and roles. Hang it in a prominent place in the classroom.

Help students prepare for the town meeting by conferring with individual students, or small groups, regarding their viewpoints about the nanotechnology issue—based upon the various roles they are playing. For example, a student playing an opponent needs to think about pollution or other negative effects of the research. Help students write statements that they will present at the town meeting, along with possible questions and responses.

Stage the town meeting by placing “officials” in front of the audience of “citizens.” The teacher acts as the moderator of the meeting. State the issue and make sure that every community member (student) contributes to the meeting. As each student speaks, he or she must identify his or her role and proceed to give thoughts using their prepared statement, about the issue. Facilitate questions and responses between opposing groups/viewpoints.

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Activity Strand:
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NanoApplications Worksheet

New technology can often be used in different ways: to help sick people, to improve people's daily lives, or to build other things. The ways in which technology is used are called applications. Below are some different ways technology applications can be categorized.

Basic Technology: Technology used in the manufacture of other things

Consumer Technology: Things for people to buy for personal use

Medical Technology: Things used to cure disease or treat the sick or injured

Military Technology: Technology for security, defense, or attack

Classify each nanotechnology example below by how many ways it can be applied: Basic Technology (BT), Consumer Technology (CT), Medical Technology (MD), or Military Technology (MT). Each example may be put in more than one category

Roll-up screens for computers and TVs	Implantable cancer detection devices
Smoother sunscreen	Super-sticky tape
Capsules to protect transplanted cells in the human body	Nanoparticles to purify drinking water
Cheap solar cells	Strong, light materials
Cameras the size of Dust	Stain-proof pants



Nano Screen

NanoProducts



Can you buy this? **Not yet**
What makes this nanotechnology?
Carbon nanotubes

Recent nanotechnology advances will lead to the smallest and thinnest electronics you've ever seen! One product could be an ultrathin monitor made with carbon nanotubes that shoot beams of electrons. If the nanotubes aim the electrons just right, so the electrons hit special chemicals in a TV screen, the screen gives off light and creates an image. Nanotubes are so much thinner than traditional TV components, you could build a 1 meter wide TV only 2 centimeters thick!



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NanoDetecto Watch

NanoProducts



Can you buy this? **Not yet**
What makes this nanotechnology?
Molecular sensors

How would you know if the air around you were dangerous to breathe, or if that sneeze your friend let out contained the flu virus? Nanotechnology is part of the newest sensors, used to detect the smallest amount of toxic chemicals, disease causing-germs, or even pollen. Such devices could easily fit into your watch or clothing, and instantly alert you to airborne dangers by changing color or giving off an electronic signal.



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Stain Resistant Nanopants

NanoProducts



Can you buy this? **Yes**
What makes this nanotechnology?
Nanowhiskers

An increasing number of fabric manufacturers are using nanotechnology to create water-resistant clothing. One way they do this is by binding tiny molecular whiskers to fabric molecules to prevent water from soaking through. Fluids just bead up and roll off. No more fruit juice stains!

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NanoSolar Cell Vest

NanoProducts



Can you buy this? **Not yet**
What makes this nanotechnology?
Nanocrystals

A solar vest made with nanotechnology could someday be as much a part of your wardrobe as your jeans. This lightweight vest would contain flexible solar cells made from tightly packed, nanosize semiconductor crystals. Solar power collected by the vest would be turned into electric current, to run all kinds of portable gear like MP3 players, laptop computers, or cell phones.

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Stink-Free Socks

NanoProducts



Can you buy this? **Yes**

What makes this nanotechnology?

Silver nanoparticles

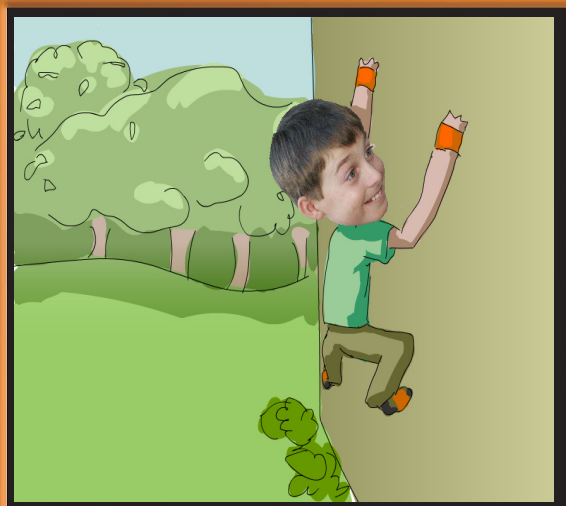
Afraid to take off your sneakers because your socks are so stinky? Nanotechnology is going to change that. Silver nanoparticles in sock fabric could kill bacteria and fungus on your feet, and stop them from smelling. Silver has long been used to stop bacterial growth, but nanotechnology has provided a better way to get silver into socks without bothering your feet or coming off in the wash.

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Superstick Tape

NanoProducts



Can you buy this? **Not yet**

What makes this nanotechnology?

Nanohairs

Imagine tape that could stick to any surface—even under water. The idea comes from gecko toes, which get their sticking power not from glue but millions of nanosize split hairs. Each split end exerts a tiny force; millions together are strong enough to let geckos scurry up walls. With enough “split ends” of the right size, superstick nanotape could let humans climb walls too!

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