**Four Key Questions**

to Always Ask Yourself

- What is the ethical question?
- What are the relevant facts?
- Who or what could be affected by the way the question gets resolved?
- What are the relevant ethical considerations?

**Ethical Considerations Relevant to This Module**

### Respect for Persons

- What kinds of actions and offers by researchers can undermine voluntary, informed consent and, hence, be disrespectful?

### Harms and Benefits

- Are the likely harms (risks) and benefits to the individual participant acceptable?
- If a participant is unlikely to directly benefit from research, what level of risk is ethically acceptable?

### Fairness

- Are all groups that are likely to benefit from the research represented among those being recruited as participants? In other words, will all groups share equally in the burdens, as well as in the potential benefits, of the research?

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*Bold* items are emphasized in this module.
ISSUES EXPLORED

- Why is it important to involve humans as participants in research?
- What ethical challenges arise when humans are participants in medical research?
- What issues should you consider if you are invited to serve as a research participant?

At a Glance

Purpose and Rationale

Biomedical research has contributed greatly to human health, providing treatments and cures for a wide range of conditions and diseases and improving quality of life. Students and their families benefit from these research advances yet often have little knowledge of how drugs, medical devices, new types of surgery, and vaccines are developed. Although testing new treatments through human clinical trials is a vital part of research, the public poorly understands this process.

Researchers have, at times, inflicted great harms on participants in clinical trials. Students should be aware of the risks that human research entails, as well as its benefits. The research community, in collaboration with ethicists and regulatory agencies, has developed guidelines to help ensure the appropriate and responsible conduct of human clinical trials. Committees called institutional review boards (IRBs) review study protocols—plans for research that include proposed protections for participants—to carefully consider the ethical implications of using humans in that research. Knowledge of the scientific design of the research and the safeguards in place to protect human participants is vital to ensuring public understanding of the research enterprise.

This module can be used in conjunction with units on the scientific method and experimental design, disease, or microbiology (bacteria and viruses). If integrated into an existing unit, the first day of the module could introduce the unit as a whole. The module can be expanded to include student-designed experiments with human subjects or integrated into lessons about how nonhuman animal experiments are also used for research.

Overview

This module focuses on the ethical considerations of doing biomedical research on humans. An asthma study simulation illustrates how researchers design clinical trials and highlights some common ethical considerations, with a particular emphasis on respect for persons and minimizing harms while maximizing benefits. Students contemplate whether they would enroll in the study. Then, they brainstorm the wide range of benefits that have resulted from human research. As they examine a case study in which a participant died (the Ellen Roche case),
they learn about guidelines and procedures that govern ethical research. Next, within the format of a structured academic controversy (a kind of small-group discussion), students discuss the ethical pros and cons of a complex case involving research into a hepatitis vaccine at an institution for mentally disabled children.

In an optional activity, students can consider what they would want to know before participating in a research study.

**Learning Objectives**

Students will

- understand that there have been widespread benefits to human health as a result of using people in research studies, but there have also been some significant abuses of research participants;
- recognize that medical research is primarily intended to advance knowledge and bring benefits to people in the future, so it often does not directly benefit the study participants;
- understand the key ethical considerations of respect for persons and harms and benefits as they relate to research ethics:
  - respect for persons requires that human research participants **volunteer** to participate and that they give their **informed consent** once they fully understand the risks and benefits of participation, and
  - ethical research also requires that human research participants are not exposed to disproportionate risks or unnecessary harms; and
- evaluate a research ethics case to develop a clearly articulated position based on reasoned arguments.

**Major Concepts**

- Biomedical research is responsible for many health benefits.
- Research with human participants is necessary to test new drugs, interventions, and treatments.
- Scientists conduct research studies involving humans much as they do other scientific experiments. All experiments are designed to answer a testable question and often involve control or comparison groups.
- Ethical guidelines govern research with human participants, including the need for informed consent and a careful weighing of harms and benefits.
- Some research is ethically problematic, and there are cases (both contemporary and historical) of the abuse of human subjects, but researchers conduct the overwhelming majority of experiments in an ethical manner.

**Assessment Outcome**

Students will analyze a complex case and use their understanding of key ethical concepts in evaluating whether the study is ethically appropriate.
Key Science Knowledge*

• Nature of science: research design, how experiments are done, the need to test one variable at a time, the need for comparison (or control) groups, and intervention vs. observational studies

• Study design: control studies, placebos, randomization, and blinding

*Bold items are explicitly addressed in this module.

Teaching Sequence Preview

Day 1—Research with Humans: Why Should It Matter? What Should the Guidelines Be?: Day 1 grounds students in scientific inquiry. They learn about (or review) study design through a hypothetical asthma study and discuss why it is important to involve human subjects in research. They then turn to two major ethical considerations that are essential for assessing the ethical appropriateness of proposed human research studies: 1) the importance of showing respect for persons by ensuring fully informed, voluntary consent and 2) ensuring that prospective studies demonstrate an appropriate risk-benefit ratio. Students decide whether or not to participate in the study they’ve been assigned to, and the willing ones are randomly assigned to the control or the experimental group.

Day 2—Harms and Benefits of Research with Humans: Students brainstorm the great benefits that have resulted from medical research, drawing on their own experiences. Next, they examine the case of Ellen Roche, a healthy, young volunteer who died in an asthma clinical trial. They then create a list of ethical guidelines for research on people and learn that federal and local guidelines govern such research.

Day 3—Analyzing the Willowbrook Case: Students debate the ethical appropriateness of a study that some people consider ethically problematic: researching a vaccine at Willowbrook, an institution for mentally challenged children. They prepare arguments that either refute or defend the research and then discuss them in a format called structured academic controversy (small-group discussion). Students complete an individual assessment that highlights their understanding of the ethical criteria that should guide human-subjects research.

In Advance

Preparing the Envelopes for Day 1, Activity 4

For Day 1, each student will need an envelope containing an asthma simulation outcome. Copy Master 5.2, cut it into sections, and put one section into each envelope. (If you plan to reuse the envelopes, make sure not to seal them.) Make approximately equal numbers of control and experimental outcomes. Be sure that most of the experimental group has a positive outcome but that at least one student has a very negative one. Make small, inconspicuous marks on the envelopes so that you can tell the control and experimental ones apart.
### Copies, Equipment, and Materials

<table>
<thead>
<tr>
<th>Activity</th>
<th>Photocopies and Transparencies</th>
<th>Equipment and Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Day 1</strong></td>
<td></td>
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<tr>
<td>1</td>
<td>1 transparency of Master 5.1 <em>for the class</em></td>
<td>1 overhead projector and 2 pill jars of different colors and shapes filled with “pills” (candies) <em>for teacher use</em></td>
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<tr>
<td>2</td>
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<td>3</td>
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</tr>
</tbody>
</table>
| 4        | • Copies of Master 5.2 for envelopes *for the class*  
• 1 section of Master 5.2 in an envelope *for each student*  
• 1 copy of Master 5.3 *for each student* | Enough envelopes *for every student*, marked “Asthma Simulation Outcome” (each containing a section of Master 5.2) |
| **Day 2** |                                |                         |
| 5        | —                              | Large sheet of paper (or tape together smaller pieces), whiteboard, blackboard, or overhead projector *for teacher use* |
| 6        | —                              | —                       |
| 7        | 1 copy of Masters 5.4 and 5.5 *for each student* | Large sheet of paper (or tape together smaller pieces), and a marker *for each group of four students* |
| **Day 3** |                                |                         |
| 8        | —                              | —                       |
| 9        | —                              | —                       |

### Masters

Master 5.1: Asthma Study Recruitment Flyer  
Master 5.2: Asthma Simulation Outcomes  
Master 5.3: The Ellen Roche Case—Research with Healthy Volunteers  
Master 5.4: Willowbrook Hepatitis Experiments  
Master 5.5: Willowbrook—Key Questions  

### Teacher Support Materials*

Master 5.5 Answer Key  
Excerpt from the Nuremberg Code  
The Belmont Report  
World Medical Association Declaration of Helsinki

*Available only online at http://science.education.nih.gov/supplements/bioethics/teacher.

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**More on the Web**

Be sure to check out Tips, Updates, and Corrections, available online at http://science.education.nih.gov/supplements/bioethics/guide.
**Purpose**

Day 1 sets the discussion of research using human subjects in the contexts of the nature of science and the principles of scientific inquiry. The activities underscore the importance of conducting research with human beings and reveal that it raises difficult ethical challenges that researchers and society must address. Another key purpose of the day is to introduce the idea that ethically appropriate studies must meet specific criteria. Day 1 focuses students’ attention on two of this supplement’s four key questions: What is the ethical question? and What are the relevant facts?

### Activity 1: Recruiting Participants

**Estimated Time:** 10 minutes

**Procedure**

1. Display the transparency of Master 5.1: Asthma Study Recruitment Flyer.

2. Set a bottle full of “pills” (candies in a pill container) on your desk, and tell students to imagine that researchers believe that this medicine will help with asthma. Explain that these are not real pills.

3. Ask students to imagine that they all suffer from asthma and to consider whether to become involved in this study.

4. Give students five minutes to think about the following questions:
   - Do you want to participate? Why or why not?
   - What are the pros and cons of being involved in this research study?

5. Ask students to write their initial thoughts on a piece of paper.

6. Ask students who would want to participate to raise their hands and then share their reasons.
7. Ask for a show of hands from those who would not want to participate. Ask those students to share their reasons.

8. Ask students to share their pro and con ideas, and write those on the board or on a transparency.

Students may identify the following pro ideas:
- It may help in finding a better treatment for future asthma patients.
- I'd get free movie tickets.
- I like to help others.
- The medicine in the study may work better than medicine that I’m taking now.

Students may identify the following con ideas:
- The medicine may be harmful.
- The medicine may be less effective than my current treatment.
- It would take time away from other things that I need to do.
- I would need to know a lot more first.

9. Ask students what they would want to know before participating in such a study.

10. List students’ responses on a board or transparency, but do not answer any questions yet.

Students may wish to know what previous studies were conducted, possible side effects, or the likelihood of harmful effects.

11. Provide additional background.

You may want to mention the following points:
- Preliminary studies in animals have shown that this medicine is effective and has apparently minimal side effects.
- Researchers have only preliminarily tested this medicine on a very small number of people.
- Without human participation in a next round of studies, it will be impossible to know whether the medicine is effective for people and what the risks or side effects could be in humans.

12. Ask students who want to participate to raise their hands again. Pick up the “pills” and begin to walk around with them.
13. Ask students, “Should I just give the medicine to everyone whose hand is raised and see what happens? If I do that, how will I be able to tell that taking the medication is more effective than not taking it?”

Students should recognize that it is important to have a comparison (or control) group.

**Activity 2:**
Scientific Research Design
Estimated Time: 15 minutes

**Procedure**

1. To initiate a discussion of the importance of controls, ask students, “What are some of the elements of a good experiment?”

   Students should mention the following elements:
   
   - A good question (meaningful, testable).
   - A good experimental design including
     - Appropriate participants, either healthy or with a condition.
     - Appropriate controls.
     - Appropriate outcome measures. For example: How will the researchers compare the control and experimental groups? By the number of hospitalizations? The number of trips to the emergency room? How each patient feels? How many times they use their inhalers?
   - A way to collect data.
   - A lack of bias in conducting experiments and interpreting results.

2. Share more information about experimental research design with students. If this is the students’ first introduction to these terms, you could write them on the board.

   You may want to mention the following points:
   
   - The purpose of most medical experiments is to prove or to suggest—with growing evidence over time—that a medical intervention such as a medicine or vaccine causes a particular result or benefit. Results and benefits could include a reduction in symptoms or prevention of a disease.
   - Many experiments compare one group of people that receives an experimental medicine or treatment (the experimental, treatment, or intervention group) with another group of people that does not (the control group).
• The experimental medicine or treatment is the independent variable. This variable represents what is different between the two groups.

• Researchers then observe what happens to each group. The change in the disease or resulting medical condition that researchers observe and measure is the dependent variable.

• If researchers randomly sort participants into two roughly equivalent groups, ensuring that they are similar to start with, and if only one of the groups receives the treatment, the study is a randomized controlled trial (RCT). Only by comparing what happens in the treatment and control groups can scientists draw reliable inferences about the effect of the treatment.

3. **Ask students how they would design a randomized controlled trial to test the asthma medication.** Give them one to two minutes to discuss, in pairs, a plan for an experiment.

   They should answer the following question: How should we conduct the experiment, based on what we just discussed about scientific design?

4. **Ask pairs of students to share their responses with the class.**

   Students should suggest that you randomly split the class in half, with one half assigned to a treatment group and the other half to a control group.

5. **Ask students, “What counts as ‘randomly splitting the class’?”**

   You may wish to use the following questions to deepen and expand the discussion:
   
   • Is it important to have equal numbers of students?
   • Is it important to have an equal number of each gender on each side?
   • Is it important to choose people with different interests such as sports or reading?

   Students should recognize that the first two considerations are important to researchers, but the last is not relevant to this kind of study.

6. **Divide the students who chose to participate in half. Assign half of them to the experimental asthma treatment group and half to the control group.**

7. **Ask students, “How do you feel about being in your assigned group? Would your previous feelings and knowledge about being in a particular group influence the outcome of the experiment? Why or why not?”**

   You may need to prompt students by asking whether they are glad to know which group they are in and why. Also ask how that knowledge might affect the results of the study.
Some students in the treatment group may be pleased that they are being singled out to get the medication, while students in the control group may be frustrated that they are not getting it. These perceptions might influence the outcome of the study because of psychosomatic effects (that is, both psychological and physiological) or the ways that people might report their reactions to the medication.

8. Ask students how they might design the study to address these problems. Share with them the concept of blinding, which means making sure that participants are unaware of which study group they are in.

9. Introduce the concept of the placebo. Ask students, “If the treatment group is getting pills, what should the control group get?”

You may want to mention the following points:

- Scientists design placebos to closely resemble the drug, but they are composed of inactive or harmless ingredients (sometimes called sugar pills).
- If there is already a good medicine for a particular condition, the control group should get that medicine because it is the current standard of care. In such cases, it would be unethical to deny the control group the standard of care. Furthermore, researchers are likely to want to know whether the new treatment is better than the current one, not just better than a placebo.

10. Place a second container of a different shape and color filled with “pills” on the table next to the first one, noting that these will be the placebos.

11. Explain that in a double-blind study, the researchers themselves don’t know which group participants are in. Ask students why that might matter.

The perceptions of the researcher may influence the interpretation of study results. Some students may have experienced this if they have wanted very badly for an experiment to support a hypothesis, regardless of the actual outcome.

12. Tell students that in the hypothetical study the class will conduct, you (the teacher-researcher) will know which group the students are in, and they will not.

13. Show students a stack of envelopes (each containing a slip from Master 5.2) and shuffle them for effect, but do not distribute them yet. Explain that the envelopes contain the assignments for the experiment.
Some students will be in the treatment group, others in the control group. Students will not know until the end of the study which group they are in.

14. **Review the key terms with the class by asking students to define them.** You may wish to give students a few minutes to try to define the terms in their own words on their own pieces of paper.

- **Control group:** A comparison group (using a placebo or standard of care).
- **Placebo:** An inactive substitute for the drug or treatment; often used by a control group.
- **Standard of care:** The most widely accepted current treatment.
- **Randomized controlled trial:** Participants are randomly sorted into experimental and control groups.
- **Blind study:** Participants don’t know which group they are in.
- **Double-blind study:** Participants and researchers don’t know which group participants are in.
- **Outcomes:** What is being measured in the end, the dependent variable(s).
- **Side effects:** Secondary effects from drugs or treatment that are usually undesired.

15. **Ask students, “What possible outcome measures could researchers use for this asthma study?”**

Answers may include number of trips to the emergency room, number of times inhaler used, exercise capacity, or changes in symptoms.

**Activity 3:**

**Two Key Ethical Considerations**

Estimated Time: 10 minutes

**Procedure**

1. **Tell students that this module will focus on two ethical questions:**

   **What are the features of ethically acceptable human research? and What is not ethically acceptable in research with humans?**

   In experiments on humans, whether something is ethically acceptable also depends on whether it is scientifically valid (in other words, logically sound and based on accurate science). It would be unethical to ask people to participate in a study that was not scientifically valid. Other features of the study are also vital to assessing whether
it is ethically acceptable. For example, it would be unethical to deny a control group access to existing life-saving medications just to see whether a new treatment might be equally effective.

2. Remind students that the class has thus far been discussing how to best conduct an experiment from a scientific standpoint.

3. Now turn their attention to a different question: What are the most acceptable ways to conduct an experiment with humans from an ethical standpoint? Begin a discussion of the ethical considerations of respect for persons and harms and benefits.

4. Ask students the following questions to illustrate how pressuring people to participate can be disrespectful.
   - What if I said you had to be in this study to pass my class?
   - What if I offer you $5 each to be part of the study?
   - What if I offer you $1,000 each to be part of the study?
   - What if you decided halfway through that you wanted to stop being in the study, but I did not allow you to stop participating?

**Respect for Persons**: Not treating someone as a mere means to a goal or end. This is often a matter of not interfering with a person’s ability to make and carry out decisions. In some cases, it is also a matter of enabling a person to make choices or supporting the person in the choices he or she makes.

5. Write the following on the board or a transparency as you discuss how to best conduct an experiment from an ethical standpoint, and ask students to record these points in their notes.

Researchers should
   - Avoid placing excessive pressure on people to participate.
   - Ensure that they have informed consent from all study participants. (For example, even if people volunteer to participate, researchers should only accept them into the study if they are informed about it and indicate they understand what is involved.)
   - Respect confidentiality. (For example, researchers should not reveal the identities of the study participants. Sometimes, participants do not want others to know that they have a disease or condition.)

6. Note that ethicists distinguish between different types of pressure. Briefly introduce the concepts of coercion, undue inducement, and exploitation.

**Coercion** refers to a threat that makes you worse off no matter which outcome you choose (“your money or your life”). In medical research, an example of coercion might be when a doctor threatens to discontinue care of a patient unless the patient participates in an experimental trial that exposes the patient to serious risk of harm.
Undue inducement refers to a situation where participants are swayed to do something with potential for serious harm (such as participate in a risky study with no benefits) by the use of incentives such as excessively large sums of money. Inducements that distort people’s judgment, leading them to agree to do something very risky that they would not otherwise do, are considered undue.

Exploitation refers to a situation where people receive unequal benefits for the burdens undertaken; one group of people benefits at the expense of others. Those who bear the risks are often in a weaker or more vulnerable position. For example, when individuals who live in developing countries are asked to bear the risks of participating in a study but never receive any benefits, it might be considered exploitation.

7. Emphasize that researchers must take care not to coerce or unduly induce individuals into participating in a study, because that would be disrespectful of them. Participants must freely agree to participate. This important concept is called voluntary consent.

8. Refer back to Master 5.1 and ask students, “Do you believe that offering free movie passes is undue inducement?”

9. Tell students that avoiding coercion and undue inducement is a way to respect a person. A second way is to ensure that researchers inform people about the study and potential risks.

10. Ask students, “Do you feel informed about the study? What more do you want to know?” Questions to stimulate discussion could include

   • What information, if any, would you want to know before you make your decision?
   • What if I didn’t tell you what the test was going to be, what any of the risks were, or whether the drug had been tried on people before?

   Students should recognize that they need to be informed about the potential risks.

11. Emphasize that researchers must consider whether participants understand what they are agreeing to do, the potential risks and benefits (if any) of participating, the purpose and goals of the research, and the alternatives they have to participating. They should also know that their participation is voluntary and that they can quit at any time. This important concept is called informed consent.

12. Share the study’s risks with students.

   Research on animals has shown that the study has two primary risks: 1) approximately 10 percent of the individuals taking this medication might gain weight (up to 10 percent of their total weight) and 2) 5 percent of the individuals had worse asthma symptoms than before, but the majority improved.
Students should recognize that researchers need to consider the appropriate balance of risks and benefits.

13. Ask students the following questions to illustrate the importance of balancing harms (risks) and benefits.
   - What if 90 percent of people who took this medication would never have asthma again? That’s a very big benefit.
   - What if that benefit came at a cost of a fatal reaction in the other 10 percent? Is that an acceptable balance? What if 1 percent had a fatal reaction?

14. Write the following on the board or a transparency to refer to as you discuss how to best conduct an experiment from an ethical standpoint, and ask students to record these points in their notes.

Researchers should
   - Avoid excessive harms to participants.
   - Ensure sufficient benefits to people in the future.
   - Balance harms and benefits appropriately.

**Activity 4: Returning to Your Decision about Participation**
Estimated Time: 10–15 minutes

**Procedure**

1. Ask students, “Do you wish to be in the asthma study now that you know more about it?” Ask all students who still want to participate in the study to raise their hands.

2. Ask students, “Would you participate in the trial even if it probably wouldn’t benefit you—because the formula isn’t perfected—but it might benefit future asthma sufferers?”

   Students should recognize that research is conducted primarily to advance collective knowledge, not mainly as treatment for individuals in the trial, and usually brings benefits to people in the future.

3. Give an envelope to each student who chooses to participate. Be sure to hand out equal numbers of experimental and control envelopes.

4. Give participating students their “medicine” (from either the control or experimental bottle of candy).
5. Ask students to open their envelopes, and tell them that, as is the case in all clinical trials, they should expect the study to have a range of outcomes. They will be affected in different ways.

The following table summarizes the outcomes if you used the 12 Master 5.2 sections:

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Control</th>
<th>Experimental</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worse</td>
<td>25% (3/12)</td>
<td>0</td>
</tr>
<tr>
<td>No change</td>
<td>17% (2/12)</td>
<td>8% (1/12)</td>
</tr>
<tr>
<td>Better and no side effects</td>
<td>8% (1/12)</td>
<td>25% (3/12)</td>
</tr>
<tr>
<td>Better but gained 4.5 kg (10 lbs.)</td>
<td>0</td>
<td>8% (1/12)</td>
</tr>
<tr>
<td>Better but severe rash</td>
<td>0</td>
<td>8% (1/12)</td>
</tr>
</tbody>
</table>

6. Ask all the students who were in the control group to stand. Ask them to raise their hands (one group at a time) if their asthma got worse, stayed the same, or got better.

7. Ask students, “Why do you think the asthma of some of the participants in the control group, all of whom received the placebo, seemed to improve?”

Students’ responses could include that participants improved due to random causes, psychosomatic effects, or other causes not associated with the study.

8. Ask students, “Was this a randomized controlled study, a blind study, or a double-blind study?”

The study was randomized, controlled, and blind. This was a blind study because the researcher (teacher) knew who was in the control and the experimental groups, but the participants (students) did not.

9. Ask all the students who were in the experimental group to stand. Ask them to raise their hands (one group at a time) if their asthma got worse, stayed the same, or got better.

10. Ask the students whose asthma got worse to share with the class whether they had any side effects.

11. Ask the students whose asthma got better to share with the class whether they had any side effects.

12. Ask students who chose not to be in the study to comment on the results.
**Closure**

Ask the class whether they think, based on this preliminary test, that researchers should test the asthma medication further and if so, why. The asthma of most individuals assigned to the experimental group improved. However, one person did get very ill, highlighting potential harms and the difficulty of weighing harms and benefits.

Some of the most important medications have come about through studies of people who have volunteered as subjects. Note that the next few activities focus on the value of that research as well as criteria that researchers must keep in mind to ensure that studies do not exploit or harm people.

**Homework**

Distribute copies of *Master 5.3: The Ellen Roche Case—Research with Healthy Volunteers* to students, and ask them to read it and then answer the reflection questions before Day 2.

**Extensions (Optional)**

If you’re interested in going further with students into the topics covered in this activity, ask them to research the following questions.

1. What kinds of clinical trials are going on right now near here? If students have Internet access, ask them to go to [http://clinicaltrials.gov](http://clinicaltrials.gov) and enter the name of the closest large city to see what trials researchers are conducting nearby. If you have Internet access in the classroom and a projector, you may wish to do this for the whole class.

2. What are the phases of clinical trials? Researchers conduct clinical trials of new treatments in three phases, followed by a fourth phase for post-marketing studies. Each phase has a different purpose and helps scientists answer different questions. You may wish to have students explore the phases in terms of the purpose of each.
   - **Phase I**: Researchers test an experimental drug or treatment in a small group of people (20 to 80) for the first time to evaluate its safety, determine a safe dosage range, and identify side effects. There is no need for a placebo or any kind of control. For many people, financial incentives provide motivation to participate in early trials.
   - **Phase II**: Researchers give the experimental drug or treatment to a larger group of people (100 to 300) to test its ability to produce a desired effect (in other words, to test its efficacy) and to further evaluate its safety. Control groups are not part of Phase II trials, either.
• **Phase III:** Researchers give the experimental study drug or treatment to even larger groups of people (1,000 to 3,000) to confirm its effectiveness, monitor side effects, compare it with commonly used treatments, and collect information that will allow people to use the experimental drug or treatment safely. Control groups are used, and the studies are blind or double-blind.

• **Phase IV:** Researchers conduct post-marketing studies to further assess the risks, benefits, and optimal use of the drug or treatment.

## Organizer for Day 1: Research with Humans—Why Does It Matter? What Should the Guidelines Be?

### Activity 1: Recruiting Participants
**Estimated Time: 10 minutes**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Display the transparency of Master 5.1.</strong></td>
<td>Page 5-6, Step 1</td>
</tr>
<tr>
<td><strong>Show students the bottle of “pills” and ask them to imagine that they all have asthma and that researchers believe that the medicine will help with asthma.</strong></td>
<td>Page 5-6, Steps 2–3</td>
</tr>
<tr>
<td><strong>Give students five minutes to write down their initial answers to these questions:</strong>&lt;br&gt;• Do you want to participate? Why or why not?&lt;br&gt;• What are the pros and cons of being involved in this research study?</td>
<td>Page 5-6, Steps 4–5</td>
</tr>
<tr>
<td><strong>Ask students who chose to participate to raise their hands and share their reasons. Then ask those who chose not to participate to do the same. Record students’ pro and con ideas on the board or a transparency.</strong></td>
<td>Page 5-6, Steps 6–8</td>
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<tr>
<td><strong>Ask, “What would you want to know before participating?” Display the responses.</strong></td>
<td>Page 5-7, Steps 9–10</td>
</tr>
<tr>
<td><strong>Tell students a little more background information, and then ask the ones who chose to participate to raise their hands again. Ask, “Should I just give the medicine to everyone raising their hand and see what happens? If I do that, how will I be able to tell that taking the medication is more effective than not taking it?”</strong></td>
<td>Page 5-7, Steps 11–13</td>
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### Activity 2: Scientific Research Design
**Estimated Time: 15 minutes (Less if students are very familiar with study design.)**

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<thead>
<tr>
<th>Step</th>
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<tbody>
<tr>
<td><strong>Ask students, “What are some of the elements of a good experiment?” Share information about experimental research design with students.</strong></td>
<td>Page 5-8, Steps 1–2</td>
</tr>
<tr>
<td><strong>Ask students, “How would you design a randomized controlled trial to test the asthma medication?” Give them one to two minutes to discuss this in pairs, and then have them share their responses with the class.</strong></td>
<td>Page 5-9, Steps 3–4</td>
</tr>
<tr>
<td><strong>Ask students, “What counts as ‘randomly splitting the class’?” Divide the students who chose to participate in half, and assign half to the treatment group and half to the control group.</strong></td>
<td>Page 5-9, Steps 5–6</td>
</tr>
<tr>
<td><strong>Ask students,</strong>&lt;br&gt;• “How do you feel about being in your assigned group?”&lt;br&gt;• “Would your prior feelings and knowledge about being in a particular group influence the outcome of the experiment? Why or why not?”</td>
<td>Page 5-9, Step 7</td>
</tr>
</tbody>
</table>
Ask students, “How might you design the study to address these problems?” Explain the concepts of blinding and placebo.

Place the second container of “pills”—the placebos—on the table.

Explain that in a blind study, the researchers themselves don’t know which group participants are in. Ask students why that might matter. Tell them that you (the teacher-researcher) will know which group students are in.

Shuffle the envelopes (each containing a slip from Master 5.2), but do not distribute them yet. Explain that they contain the group assignments.

Review these terms with the class: control group, placebo, standard of care, randomized controlled trial, blind study, double-blind study, outcomes, and side effects.

Ask, “What outcome measures could researchers use for this asthma study?”

### Activity 3: Two Key Ethical Considerations
**Estimated Time: 10 minutes**

Tell students that this module focuses on two ethical questions:

- What are the features of ethically acceptable human research?
- What is not ethically acceptable in research with humans?

Explain that so far, the class has discussed how to best conduct an experiment from a scientific standpoint. Now, students will discuss what the most acceptable ways to conduct an experiment with humans from an ethical standpoint are.

Ask students questions that show how pressuring people to participate can be disrespectful.

Write down the guidelines researchers should follow as you discuss how to conduct an experiment ethically. Students should record these points.

Introduce the concepts of coercion, undue inducement, and exploitation. Emphasize that it is disrespectful to coerce or unduly induce individuals into participating in a study. Participants must give their voluntary consent.

Referring to Master 5.1, ask students, “Do you feel that offering free movie passes is undue inducement?”

Tell students that avoiding coercion and undue inducement is a way to respect a person. A second way is to ensure that the person is informed about the study and potential risks.

Ask students, “Do you feel informed about the asthma-medication study? What more do you want to know?” Discuss informed consent.

Share the study’s risks with students. Ask them questions that show how important balancing harms (risks) and benefits is.

Display the three important ethical practices in Step 14 as you discuss how to conduct experiments ethically, and ask students to record the practices.
### Activity 4: Returning to Your Decision about Participation

**Estimated Time: 10–15 minutes**

<table>
<thead>
<tr>
<th>Step</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ask students, “Do you wish to be in the asthma study now that you know more about it?” Ask all students who still want to participate to raise their hands.</td>
</tr>
<tr>
<td>2</td>
<td>Ask, “Would you participate in the trial even if it probably wouldn’t benefit you—but it might benefit future asthma sufferers?”</td>
</tr>
<tr>
<td>3</td>
<td>Give an envelope (each containing a slip from <strong>Master 5.2</strong>) to each participant. Hand out equal numbers of experimental and control envelopes.</td>
</tr>
<tr>
<td>4</td>
<td>Give participants their “medicine” (from either the control or experimental bottle of candy). Ask them to open their envelopes.</td>
</tr>
<tr>
<td>5</td>
<td>Ask all the students who were in the control group to stand. Ask them to raise their hands (one group at a time) if their asthma got worse, stayed the same, or got better.</td>
</tr>
<tr>
<td>6</td>
<td>Ask, “Why do you think the asthma of some of the participants in the control group seemed to improve?”</td>
</tr>
<tr>
<td>7</td>
<td>Ask students, “Was this a randomized, controlled, blind, or double-blind study?” (It was randomized, controlled, and blind.)</td>
</tr>
<tr>
<td>8</td>
<td>Ask the students in the experimental group to stand. Ask them to raise their hands (one group at a time) if their asthma got worse, stayed the same, or got better.</td>
</tr>
<tr>
<td>9</td>
<td>Ask students whose asthma got worse to share with the class whether they had any side effects. Ask students whose asthma got better if they had any side effects. Ask students who chose not to be in the study to comment on the results.</td>
</tr>
<tr>
<td>10</td>
<td><strong>Closure:</strong> Ask students whether they think that researchers should test the asthma medication further and if so, why.</td>
</tr>
<tr>
<td>11</td>
<td><strong>Homework:</strong> Distribute copies of <strong>Master 5.3</strong> to students, and ask them to read the master and answer the reflection questions before Day 2.</td>
</tr>
<tr>
<td>12</td>
<td><strong>Extensions (optional):</strong> Ask students to research the following questions:</td>
</tr>
<tr>
<td></td>
<td>1. What kinds of clinical trials are going on right now near here?</td>
</tr>
<tr>
<td></td>
<td>2. What are the phases of clinical trials?</td>
</tr>
</tbody>
</table>
DAY 2: Harms and Benefits of Research with Humans

PURPOSE

Day 2 activities emphasize the great advances brought about by biomedical research and draw attention to possible dangers and risks of involving people in research studies.

ACTIVITY 5: The Benefits of Human Research
Estimated Time: 10 minutes

PROCEDURE

1. Remind students that yesterday’s lesson focused on an asthma research study. Today, the class will look at biomedical research with humans in the context of the ethical consideration of harms and benefits.

2. Ask students to take out a piece of paper and fold it in half lengthwise.

3. Tell students to label the columns “Conditions or Diseases Helped by Biomedical Research” and “Health Treatments Resulting from Biomedical Research.”

You may need to clarify that a treatment in this case means some kind of general discovery, procedure, device, etc.

4. Give students five minutes to list as many things as they can under each column.

If students need prompting, you may wish to give them examples of conditions or diseases helped by biomedical research such as asthma and polio. You may also want to clarify that health treatments resulting from biomedical research include medications, medical devices (artificial hips), surgeries (arthroscopic surgeries), and vaccines.

TEACHING STRATEGIES

You may want to encourage a little competition by asking students if they can think of at least 10 items for each column.
5. Discuss the results with the whole class, writing answers for all to see on a large piece of paper, the board, or a transparency.

Conditions or diseases may include

- Infectious diseases such as ear infections, strep throat, pink-eye, mononucleosis, flu, polio, HIV, human papilloma virus (HPV), measles, chickenpox, and polio.
- Congenital diseases—illnesses that you are born with—including genetic diseases such as phenylketonuria (PKU), congenital heart problems, cystic fibrosis, and sickle cell disease.
- Cancers such as childhood leukemia and breast, prostate, and lung cancer.
- Chronic diseases—prolonged conditions that are rarely cured completely—such as arthritis, diabetes, depression, hepatitis, asthma, and alcoholism.
- Heart and lung diseases.
- Diseases or conditions of pets or other nonhuman animals such as feline leukemia vaccine, surgeries, and insulin for diabetic animals.

Health treatments resulting from biomedical research may include

- Medical devices such as heart defibrillators, catheters, stents, shunts, and pacemakers.
- Surgeries such as heart-bypass surgery, knee surgery, laser eye surgery, and organ transplantation.
- Vaccines such as smallpox and polio.
- Drugs including painkillers, antibiotics, medicine for high blood pressure and cholesterol, and birth control pills.

6. Emphasize that biomedical research has yielded many health benefits that are often taken for granted.

Research using a variety of different approaches and models—including computer models, tests on cell cultures, animal models, and human clinical trials—has contributed to advances in health. However, at some point, scientists tested almost all of the advances in humans. Only with careful human studies can it be determined whether a new vaccine, drug, or treatment is truly beneficial.

7. Share with students that there are occasions when research has also caused harm. One example is the case of Ellen Roche, which they read about for homework.
Activity 6:
The Risks of Research—The Ellen Roche Case
Estimated Time: 15 minutes

Procedure

1. Ask students to take out Master 5.3: The Ellen Roche Case—Research with Healthy Volunteers, which they completed for homework.

2. As part of a whole-class discussion, have students share the main points of the case and their answers to the reflection questions on Master 5.3.

   **Question 1** could be answered this way: *This case focuses on a small, early-stage study of a disease mechanism rather than a randomized controlled trial of a new treatment. Individuals inhaled a chemical, and the effects on lungs were observed. Researchers were not trying to improve the health of the participants. There was no control group.*

   **Question 2** possible answer: *The role of an IRB is to review research proposals to ensure that they are scientifically sound and ethical.*

   **Question 3:** *Some students may argue that Roche was not forced into participating and may have had altruistic motives. Others may argue that individuals who work at centers conducting research may feel coerced to be involved.*

   **Question 4:** *Asthma is widespread and a truly challenging health problem. Research is clearly needed to help those who suffer from it. Roche did not stand to personally benefit from this study, however, and she assumed risks. The level of risks was unclear even to the researchers and the IRB, so it was also unclear to Roche.*

   Be sure to emphasize the challenge of balancing harms and benefits when conducting research with humans.

3. Emphasize that scientists have made a great deal of progress in asthma research, and that the vast majority of research is both scientifically and ethically sound. Note that the few cases when something goes wrong are the ones that most clearly bring the ethical conflicts and tensions to people’s awareness.

4. Point out that in the Roche case, in addition to the normal risks that research participants bear, there were questions about how the researchers conducted the study. Note that sometimes even in the most carefully considered, ethical trials, people can still be harmed because research is inherently risky. Not all harms are the result of unethical behavior.
5. **Summarize two key points about risks.**
   - Sometimes risks arise because the scientist mistakenly believes something is safe when it is not. For example, in the Roche case, the researchers thought the hexamethonium was safe to inhale when it was not.
   - Sometimes risks come about just by the nature of research itself, which, by definition, involves unknowns. For example, researchers may not know the full range of side effects of a substance or how different people might react to it. So, harms are still possible even when the study is scientifically and ethically sound.

6. **Tell students that because harms are possible, the research community (in collaboration with ethicists and regulatory agencies) has developed guidelines to help ensure the appropriate and responsible conduct of human clinical trials.**

7. **Tell students that they will next consider what some good guidelines or rules might be for conducting research ethically.**

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**Activity 7:**
**Guidelines for Ethical Research**

*Estimated Time: 15 minutes*

**Procedure**

1. Divide the class into small groups of three to four students.

2. Give each group a large sheet of paper and colored markers.

3. On the basis of their understanding of research and the case they read for homework, ask each group to write its own “Guidelines for Ethical Research” that researchers should follow.

4. Ask students to develop one or two rules related to each of the module’s two ethical considerations—respect for persons and harms and benefits.

   For example, “People who participate in research need to have all known risks explained to them.”

   You might want to have students consider these factors as they develop rules:
   - Value of research (social or scientific)
   - Reliability and validity of scientific results
   - Fairness in selecting participants
   - Review of research by independent reviewers
   - Avoiding conflicts of interest
5. Ask each group to share its rules with the class. Post each list on the wall after the groups have presented.

6. Debrief the rules exercise as a whole class.

Emphasize the following points:

- Researchers can demonstrate respect for persons in several ways: by not coercing or unduly inducing people to participate and by making sure participants understand the risks and benefits. Scientists express their commitment to respecting persons through voluntary, informed consent.

- Voluntary, informed consent by itself is not enough. Researchers also need to be sure that the research they want to undertake is not unduly risky—the benefit-to-risk ratio needs to be acceptable. In other words, even if lots of people would volunteer to participate, that alone does not make the research ethical; it has to reach a certain threshold of safety, produce valid data, and be fair.

7. Explain to students that scientists, ethicists, and regulatory agencies have developed guidelines for conducting research on humans, given the potential for harms and the need to respect volunteers. These include the Nuremberg Code, the Belmont Report, and the Declaration of Helsinki.

You may want to mention the following points:

- The Nuremberg Code was formulated as a result of the Doctors’ Trial at the end of World War II. Nazi physicians were convicted of grossly violating human rights by conducting experiments on concentration camp prisoners and others, without their consent. Many experiments harmed and even killed participants. The Nuremberg Code emphasized the importance of voluntary, informed consent.

- The Belmont Report was developed by the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research in 1979. It was written largely in reaction to ethical violations in federally sponsored research, particularly the U.S. Public Health Service’s Syphilis Study at Tuskegee. In that study, the U.S. Public Health Service observed 600 black men (399 with syphilis and 201 without it) in Alabama over 40 years (1932–1972). Most of the men were illiterate sharecroppers who were told they had “bad blood” and that they were being “treated.” It was an observational study that aimed to see whether the course of syphilis was different in whites and blacks. Antibiotic treatment was withheld even when it became widely available in the 1940s and 1950s. Much of the reluctance of African Americans to participate in human research stems from the revelations surrounding this study and others like it.
• The Belmont Report has served as a guide to the oversight of research with humans in the United States. The report clearly articulates three ethical considerations (principles): respect for persons, beneficence ("do good"), and justice ("ensure that the risks and the benefits of research are fairly shared") as they relate to research with human participants.

• The Declaration of Helsinki, developed by the World Medical Association, provides guidelines for medical researchers about the use of human subjects. It was first ratified in 1964 and has been revised five times, most recently in 2000.

See Teacher Support Materials
A Nuremberg Code excerpt, the Belmont Report, and the Declaration of Helsinki are available online at http://science.education.nih.gov/bioethics/teacher.

8. Point out that these documents reflect how research guidelines for human subjects have evolved over time.

For example, in its mandate for informed consent, the Nuremberg Code states that using children in research is problematic. Also, the Nuremberg Code and the Declaration of Helsinki guidelines treat research that has no benefits in different ways. While the Declaration of Helsinki provides guidelines for "non-therapeutic research," it is not clear that such research would be allowed under the Nuremberg Code. The Declaration of Helsinki, first published in 1964, has undergone multiple revisions.

9. Tell students that in addition to these guidelines, review boards at research institutions (institutional review boards, or IRBs) and the Office for Human Research Protections (of the federal government) also monitor research.

Closure

Remind students that they have explored both the benefits of research in terms of improving human health in the future and some of its challenges, such as risks to participants. The next activity, which focuses on the Willowbrook Study, invites students to apply what they have learned about research to deciding whether one historically well-known study was conducted ethically.
Homework

Have students prepare for Day 3 by reading parts of Master 5.4: Willowbrook Hepatitis Experiments and filling out page 1 of Master 5.5: Willowbrook—Key Questions.

- Divide students into groups of four. (Having one or two smaller or larger groups is not a problem; you can adjust for that during the activity.) Assign half of each group to the pro side of the Willowbrook case and the other half to the con side. On Day 3, the pairs in each group will present their sides to each other.
- Give all students a copy of Master 5.4. Have them read the Background and Letter to Parents (pages 1 and 2). In addition, ask pro-side students to read the Pro material and con-side students to read the Con material.
- Give all students a copy of Master 5.5. Tell them that the ethical question will be, Was the Willowbrook Study conducted ethically? Ask them to complete page 1 of Master 5.5 for homework using what they learned from Master 5.4.

See Teacher Support Materials
An answer key for Master 5.5 is available online at http://science.education.nih.gov/supplements/bioethics/teacher.

Extension (Optional)

Students could compare their rules and regulations with those of the Nuremberg Code, the Declaration of Helsinki, and other codes of medical ethics.
### Activity 5: The Benefits of Human Research
**Estimated Time: 10 minutes**

Remind students that yesterday’s lesson focused on an asthma research study. Today’s focuses on biomedical research with humans in the context of harms and benefits.

<table>
<thead>
<tr>
<th>Step</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Remind students that yesterday’s lesson focused on an asthma research study. Today’s focuses on biomedical research with humans in the context of harms and benefits.</td>
</tr>
<tr>
<td>2–3</td>
<td>Ask students to take out a piece of paper and fold it in half lengthwise. Tell them to label the columns “Conditions or Diseases Helped by Biomedical Research” and “Health Treatments Resulting from Biomedical Research.”</td>
</tr>
<tr>
<td>4</td>
<td>Give students five minutes to list as many things as they can under each column.</td>
</tr>
<tr>
<td>5</td>
<td>Discuss the results with the class, and record and display students’ answers.</td>
</tr>
<tr>
<td>6</td>
<td>Emphasize that biomedical research has yielded many health benefits that are often taken for granted.</td>
</tr>
<tr>
<td>7</td>
<td>Share with students that research has also caused harm. One example is the case of Ellen Roche, which they read about for homework.</td>
</tr>
</tbody>
</table>

### Activity 6: The Risks of Research—The Ellen Roche Case
**Estimated Time: 15 minutes**

<table>
<thead>
<tr>
<th>Step</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–2</td>
<td>Ask students to take out Master 5.3, which they completed for homework. Have them share with the class the main points of the case and their answers to the reflection questions.</td>
</tr>
<tr>
<td>3</td>
<td>Emphasize that the vast majority of research is both scientifically and ethically sound. Note that the few cases when something goes wrong are usually the ones that bring the ethical conflicts and tensions to people’s awareness.</td>
</tr>
<tr>
<td>4</td>
<td>Point out that in the Roche case, there were questions about how the researchers conducted the study. Note that sometimes even in the most carefully considered, ethical trials, people can still be harmed because research is inherently risky.</td>
</tr>
</tbody>
</table>
| 5 | Summarize two key points about how risks arise:  
  - the scientist believes something is safe when it’s not and  
  - research by its very nature involves unknowns. |
| 6–7 | Tell students that because harms are possible, mechanisms for ensuring ethical conduct of human clinical trials have been developed. |
### Activity 7: Guidelines for Ethical Research

**Estimated Time:** 15 minutes

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>Divide the class into small groups of three to four students. Give each group a large sheet of paper and colored markers.</td>
</tr>
<tr>
<td>3-4</td>
<td>Ask each group to write its own “Guidelines for Ethical Research.” It should include one or two rules related to each of the module’s two ethical considerations—respect for persons and harms and benefits.</td>
</tr>
<tr>
<td>5</td>
<td>Ask each group to share its rules with the class. Post the lists on the wall.</td>
</tr>
<tr>
<td>6</td>
<td>Debrief the rules exercise as a whole class.</td>
</tr>
<tr>
<td>7-8</td>
<td>Explain that scientists, ethicists, and regulatory agencies have developed guidelines for conducting research with human participants, which have evolved over time. These include the Nuremberg Code, the Belmont Report, and the Declaration of Helsinki.</td>
</tr>
<tr>
<td>9</td>
<td>Tell students that IRBs and the federal Office for Human Research Protections also monitor research.</td>
</tr>
<tr>
<td>10</td>
<td><strong>Closure:</strong> Remind students that they have explored both the benefits of research (improving human health in the future) and some of its challenges, such as risks to participants.</td>
</tr>
<tr>
<td>11</td>
<td><strong>Homework:</strong> Students prepare for Day 3 by reading pages 1 and 2 of Master 5.4 and filling out page 1 of Master 5.5.</td>
</tr>
<tr>
<td>12</td>
<td><strong>Extension (optional):</strong> Students could compare their rules and regulations with those of the Nuremberg Code, the Declaration of Helsinki, and other codes of medical ethics.</td>
</tr>
</tbody>
</table>

*Page 5-24, Steps 1–2*

*Page 5-24, Steps 3–4*

*Page 5-25, Step 5*

*Page 5-25, Step 6*

*Page 5-25, Steps 7–8*

*Page 5-26, Step 9*

*Page 5-26*

*Page 5-27*
DAY 3: Analyzing the Willowbrook Case

Purpose
On Day 3, students examine the important Willowbrook case. There has been considerable debate about whether the research that took place at Willowbrook was ethical. Students apply what they've learned about ethical considerations (respect for persons, harms and benefits) to the case. In an optional extension activity, students can consider what they would want to know about a research study before deciding to participate in it.

Activity 8:
Introduction to the Willowbrook Case—What Is the Ethical Question?
Estimated Time: 5 minutes

Procedure
1. Ask students to take out their homework from the previous night.

2. Briefly restate the ethical question: Was the Willowbrook Study conducted ethically? Tell students that answering this question will be today’s focus.

3. Summarize the case for students: Children with mental disabilities who were institutionalized were exposed to hepatitis as part of a research study.

4. Ask students, “Why might research with children be different from research with adults?”

Students may offer these answers:
- Children are considered a vulnerable population because they presumably cannot understand all the potential risks (harms) and benefits of a study. This is especially true in the Willowbrook case because the children had mental disabilities.
- Children’s guardians have authority over them and responsibility for decisions that affect them. Therefore, the guardians are the ones who must give permission for children to participate in research.

5. Explain to students that this case has been routinely cited as having serious ethical problems. However, in recent years, many scholars have defended the research. The case is more complicated than it first appears.
6. To prepare students for the next activity, ask them to move into their groups of four, with two students representing the pro side and two students representing the con side.

**ACTIVITY 9:**
Structured Academic Controversy—Developing Pro and Con Arguments

Estimated Time: 35 minutes

The structured academic controversy is a useful teaching strategy for fostering student discussion of ethical questions. Because students are in small groups, the discussion stays manageable. Also, students are exposed to both sides of an argument before discussing their own personal views. They must actively listen to their peers to understand the information at hand. Lastly, they must clarify where they agree or disagree with their peers.

**Teaching Strategies:**
Facilitating a Structured Academic Controversy

- At each transition, give students a signal (such as blowing a whistle) that it's time to proceed to the next step.
- It may help to post the procedure where all can see it and to give students cues when the time for the next transition is approaching.
- While students are talking, circulate among them to ensure that their discussions stay on topic and that they understand the procedure.


**Procedure**

1. Briefly (in about five minutes) review the structured academic controversy format with students, described in Steps 2 though 9 on pages 5-32 and 5-33.
Deciding on and Recording Main Points

2. Have students discuss the case with their partners for two to three minutes. Ask them to decide on the main points of their position and record them on page 2 of Master 5.5.

Each pair will discuss what they believe are the main points of their side and choose at least three main points. They can use material from the Background section and their Pro or Con section of Master 5.4.

See Teacher Support Materials

An answer key for Master 5.5 is available online at http://science.education.nih.gov/supplements/bioethics/teacher.

Presenting the Pro Side

3. Ask the pro side in each group to present its main points to the con side, which cannot respond while the pro side is speaking.

After the pro side is finished, the con side may ask clarifying questions but not engage in further discussion.

4. Have the con side share back to the pro side what it heard as the main points.

The pro side has the opportunity to correct any misconceptions or errors.

Presenting the Con Side

5. Have the con side present its main points to the pro side, which cannot respond while the con side is speaking.

After the con side is finished, the pro side may ask clarifying questions but not engage in further discussion.

6. Have the pro side share back to the con side what it heard as the main points.

The con side has the opportunity to correct any misconceptions or errors.

Assessment

Circulate during the discussions to note the points students are making in their small groups.

Dropping Sides and Discussing

7. After the sharing is complete and students understand the main arguments of both sides, have them drop roles and discuss the case from their own personal perspectives.

Discussing and Recording

9. Give students time to discuss and record (individually) the points of agreement and disagreement on page 3 of Master 5.5.

Encourage students to stay open to modifying their positions based on what was discussed.

Closure

Remind students that they have analyzed a study to determine whether it was conducted ethically. They should now understand the importance of research studies, as well as the care needed to protect study participants.

Final Assessment

Give students time to record their own perspectives on page 4 of Master 5.5, which is the final assessment. Make sure students understand that they should do this individually, not in groups or pairs.

Extension (Optional)

To continue the discussion, ask students, “Would you participate in a research study? What would you want to know before you decide?” In describing the important factors related to making such a decision, students should refer to both the scientific aspects of the study and the ethical considerations emphasized in this module.
## Organizer for Day 3: Analyzing the Willowbrook Case

### Activity 8: Introduction to the Willowbrook Case—What Is the Ethical Question?
**Estimated Time: 5 minutes**
- Ask students to take out last night’s homework (*Master 5.4*, page 1 of *Master 5.5*).  
  - Page 5-30, Step 1
- Restate the ethical question, and tell students that answering it will be the focus of Day 3: Was the Willowbrook Study conducted ethically?  
  - Page 5-30, Step 2
- Summarize the case for students.  
  - Page 5-30, Step 3
- Ask, “Why might research with children be different from research with adults?” Discuss possible answers.  
  - Page 5-30, Step 4
- Explain that the Willowbrook Study has been routinely cited as having serious ethical problems, and that it is more complicated than it first appears.  
  - Page 5-30, Step 5
- Ask students to move into their groups of four, with pro students sitting together and con students sitting together.  
  - Page 5-31, Step 6

### Activity 9: Structured Academic Controversy—Developing Pro and Con Arguments
**Estimated Time: 35 minutes**
- Briefly review the structured-academic-controversy format (Steps 2–9 below).  
  - Page 5-31, Step 1
- **Deciding on and Recording Main Points:** Have students discuss the case with their partner and record the main points of their position on page 2 of *Master 5.5*.  
  - Page 5-32, Step 2
- **Presenting the Pro Side:** Ask the pro side in each group to present its most important points to the con side. Have the con side share back what it heard.  
  - Page 5-32, Steps 3–4
- **Presenting the Con Side:** Ask the con side to present its most important points to the pro side. Have the pro side share back to the con side what it heard as the main points.  
  - Page 5-32, Steps 5–6
- **Dropping Sides and Discussing:** Once each side understands the main arguments of the other side, have students drop roles and discuss the case from their personal perspectives. Ask them, “What do you think? Was the Willowbrook Study conducted ethically? Why or why not?”  
  - Page 5-32, Steps 7–8
- **Discussing and Recording:** Give students time to discuss and record (individually) the points of agreement and disagreement on page 3 of *Master 5.5*.  
  - Page 5-33, Step 9
- **Closure:** Remind students that they have now analyzed a study to determine whether it was conducted ethically.  
  - Page 5-33
- **Final Assessment:** Students record their own perspectives on page 4 of *Master 5.5*.  
  - Page 5-33
- **Extension (optional):** Ask students, “Would you participate in a research study? What would you want to know before you decide?” Students should refer to both the scientific aspects of the study and the ethical considerations.  
  - Page 5-33