Walch Science Literacy Series
Health

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WALCH PUBLISHING

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To the Teacher

As teachers, what do any of us want for students? In addition to wishing them healthy and fruitful lives, we want them to be able to think. We want them to be literate in the fields we teach year after year. We want them to develop the thinking skills that will allow them to be respected and productive. We hope that they will be critical of false claims and weak arguments. We urge them to study so that they may possess that special body of knowledge that will help them to do their jobs better. In addition, we want them to develop habits of mind that characterize good thinkers. In this program we have developed a tool that will help you direct your efforts to a very worthwhile end, namely teaching science literacy.

What Is Science Literacy?

Project 2061, sponsored by the American Association for the Advancement of Science (AAAS), seeks to promote literacy in science in order to help people live interesting, responsible, and productive lives in a society in which science, mathematics, and technology are central.

In the book *Science for All Americans,* Project 2061 defines science literacy as "what every high school graduate should understand about science, mathematics and technology." It recommends that scientific literacy include:

- Being familiar with the natural world and recognizing both its diversity and its unity
- Understanding key concepts and principles of science
- Being aware of some of the important ways in which science, mathematics, and technology depend on one another
- Knowing that science, mathematics, and technology are human enterprises, and knowing what that implies about their strengths and limitations
- Having a capacity for scientific ways of thinking
- Using scientific knowledge and ways of thinking for individual and social purposes

What Are Habits of Mind?

Science literacy requires ways of understanding and habits of mind that allow people to grasp what science and technology are about, to make some sense of how the natural and designed worlds work, to think critically and independently, and to recognize and weigh alternative explanations of events.

Habits of mind refer to thinking skills, values, and attitudes that, taken together, relate directly to a person's outlook on knowledge and ways of thinking and acting. Habits of mind need to be learned in the context of all scientific content areas. Students need not only to acquire these skills but also to be able to use them in new situations, both in and out of school.

More specifically, habits of mind include values and attitudes, computation and estimation skills, manipulation and observation skills, communication skills, and critical response skills.

The *Walch Science Literacy Series* uses a variety of content areas to help students develop the necessary habits of mind needed by a scientifically literate person. The following list of habits of mind describes the science literacy skills included in the series.

Values and Attitudes

- Raise questions and seek answers.
- Make hypotheses.
- Make careful observations.
- Keep honest, clear, accurate records.
- Offer reasons for findings.
- Understand that different explanations can be offered and that it isn't always possible to tell which is correct.
- Value and exhibit curiosity, honesty, openness, and skepticism.
- View science and technology thoughtfully.

Computation and Estimation Skills

- Manipulate numbers mentally.
- Translate from common fractions to decimals.
- Estimate measurements and computations.
- Judge whether measurements and computations are reasonable.
- Understand the purpose of each step in a calculation.
- Determine the units in which an answer should be expressed.
- Estimate probabilities of outcomes.

Manipulation and Observation Skills

- Use common tools.
- Operate common audio equipment.
- Make simple models and equipment.
- Repair things.

- Keep a notebook that describes observations and distinguishes these from speculations.
- Calculate and compare areas and volumes.
- Read analog and digital meters on instruments.
- Disassemble and reassemble simple mechanical devices.
- Understand the purposes of the parts of simple mechanical devices.

Communication Skills

- Describe and compare things in terms of number, shape, texture, size, weight, color, or motion.
- Draw pictures that correctly portray observations.
- Write and illustrate instructions to carry out a procedure.
- Use numerical data in descriptions.
- Organize information in simple tables and graphs.
- Read tables and graphs of all kinds.
- Locate information in reference books, newspapers, magazines, CDs, databases, and the Internet.
- Make and interpret scale drawings.

Critical Response Skills

- Support statements with facts from books or other sources, and identify the sources.
- Recognize faulty comparisons.
- Seek evidence for believing something, and discount reasons based on hearsay or speculation.
- Question claims built on vague attributions.
- Compare consumer products.
- Be skeptical of arguments based on very small samples of data, biased samples, or samples not matched with controls.
- Notice and criticize the reasoning of faulty arguments.
- Check graphs to see that they do not misrepresent data.
- Compare probabilities with chance.
- Insist that critical assumptions behind an argument be made explicit.
- Recognize arguments based on selected data.
- Suggest alternative ways of explaining data.

The foregoing list, while long, does not cover every conceivable habit of mind, but it does provide you with the insight and understanding necessary to be able to teach successfully a set of identified and organized thinking skills to your students.

To the Student

How would you like to be one of the best thinkers in your school? Would you like to be able to put pieces of a problem together quickly and thoroughly in order to find a solution? Do you want to be able to spot flaws in weak arguments? Can you develop a strategy for setting up an experiment that will work to give you an answer to a problem?

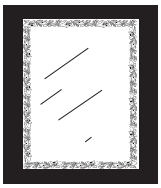
Most students would like to be able to do all these things. But some of them are not as successful as they could be because they have not developed the skills—the "habits of mind"— of really good thinkers. In this program you will learn some new thinking skills, and you will know when you are using them. You will become a more effective thinker and problem solver as you work through the science situations in this book.

Our best wishes for good thinking.

Activity 1

What Really Makes You Likable?

Self-Esteem



"I'd say my nose," said Traci, tapping the tip of her nose with her finger. "I'm not crazy about its shape. It stands out so much."

"Not really," chimed in Mike, looking at Traci. "I used to think my whole profile was too sharp and, you know, angular. But then I noticed in a picture of my great-grandmother that she had the same profile. I thought that was pretty neat. Now I'm proud of it."

As the friends walked home from school, the conversation had at first been about who were the best-looking movie stars. Somehow it had turned into a "true confessions" of what **features** people didn't like about themselves.

"How about feet?" Juanita added.

Everyone groaned, "Oh no, not feet!"

"Nobody likes their feet," stated TJ.

He seemed to be right. Everyone had something to say all at once about that subject.

"My second toe is longer than my big toe."

"My big toe curves."

"There's barely any nail on my little toe."

"My feet are so big; I haven't grown into them yet."

By now, commenting on different features had become a game.

"Okay—ears," someone shouted.

"Mine are too big," Mike blurted out.

"Are you kidding? Look how these things stick out," laughed Juanita.

"I don't have a left one," said TJ.

"Mine are too . . . what?" asked Traci.

"Huh?" said the others.

As his friends all turned toward TJ, he brushed back the hair that covered only the top of where his left ear would be. He wasn't kidding; only bumpy tissue marked part of a circular area where the ear would have been.

"When did this happen?" Traci asked.

"I was born with it—or without it, I should say," said TJ smiling.

Everyone was amazed that they had never noticed TJ had only one ear, and most of them had known each other since preschool. TJ didn't wear his hair particularly long; he never felt the need to hide anything. He was popular and kind and had a smile for everyone. Throughout grade school and middle school, hardly anyone had even noticed that he didn't have a left ear. TJ knew as well as anybody that how you act is more important to others than what you look like.

"Okay TJ, you win the ears contest," Juanita joked. "Now, let's talk about hair!" They all laughed as they continued their game, comfortable in knowing that they weren't perfect—and that they didn't have to be.

1. What kind of a person do you think TJ is? List four characteristics that describe him.

_____

_____

_____

_____

2. How would you describe the group of friends in this lesson? Would you like to have these people as friends? Why or why not?

_____

_____

_____

_____

_____

3. If you were part of the conversation with TJ and his friends, what physical feature about yourself would you have mentioned? How would you feel about talking about it?

_____

_____

_____

_____

4. What do you think is the message of this lesson?

_____

_____

_____

_____

Designing a Perfect Person

GOAL

To compare the **traits** of a "perfect" person to those of real people and decide which traits are most important in a friend

MATERIALS

You will need paper and pencil.

PROCEDURE

1. List the traits or qualities that you would use to describe a perfect person—male or female. Include physical and nonphysical traits. You might use traits from many different people—people you know personally as well as celebrities. When you are done, look over your list to see if you want to make any additions or replacements.
2. Then try to think of a person who you are certain has all of the traits you listed.
3. Next, place a check mark next to the traits you think are most important in a friend. Try to limit these traits to no more than half of your total list.
4. Finally, underline the traits you think you have.

RECORD KEEPING: Use a table like the one below to list traits. When you make your table, leave the bottom open until you are done so that you have room to add more traits as you think of them.

Physical Traits	Nonphysical Traits

CONCLUSIONS: Is there a person who is "practically perfect in every way?" Is it healthful to try to be perfect? Why or why not?

APPLICATION: How could you use your list of traits to help make wise decisions about friendships?

How Open and Honest Can You Be?

State a fault that you have. The fault cannot refer to your appearance. It might involve the way you treat someone, the way you think about something, how you go about doing things, or some other characteristic you have that you are not particularly pleased with. Explain why you think it is a fault. Then ask a friend or family member if he she considers it a fault in you. Together with this person, come up with a suggestion for correcting the fault.

1. **My fault** _____

   _____

2. **Why it's a fault** _____

   _____

   _____

3. **What my friend/family says** _____

   _____

   _____

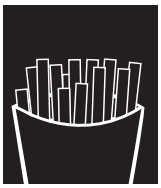
4. **How to correct the fault** _____

   _____

   _____

   _____

   _____



Activity 1

Don't Supersize Those Fries

Here is a little quiz for you. Which of the following statements do you think are true?

- One out of three Americans is obese, which means extremely overweight.
- Between 15 and 30 percent of American children and teenagers are obese—three times more than in 1980.
- On average, each American eats almost 1,800 pounds of food every year—300 pounds more than in 1970.
- Problems with overweight cause between 300,000 and 400,000 deaths in the United States each year.

So, which statements do you think are true? They all might seem pretty unbelievable. Well, guess what? They ALL are true! These are just some of the facts that show there is a problem with obesity in America. But here is one more fact to add to the list: You can do something about it.

Before jumping to the solution, let's find out a little more about the problem. Being obese means being very overweight. Obesity is measured by comparing height to weight. For example, compare these two people:

	Height	Weight
Person A	5'0"	160 lbs
Person B	5'8"	160 lbs

Both people weigh the same—160 pounds. Person A, however, is much shorter. Person A is considered obese because the 160 pounds is concentrated in a much smaller area. Person B, on the other hand, has a healthy weight because that same weight is spread out over a larger area. A health professional can tell if a person is underweight, a healthy weight, overweight, or obese.

Obesity causes health problems for children and adults. They include higher risk of

- heart disease
- high blood pressure
- diabetes
- stroke
- liver disease
- breathing problems

Obese people, especially teens, also often have lower self-esteem. Physical activities become more difficult, whether the activity is running down the soccer field or raking leaves.

More people are obese today than ever before. Why? It's simple: We are eating more and exercising less. Food portions are getting bigger and bigger. Have you checked out the size of the popcorn buckets at the movies lately? Many vending machines carry 16-ounce bottles of drink instead of 12-ounce cans. Double cheeseburgers, super-sized fries—the list goes on and on. Even foods that are healthy are often served in portions larger than we need. For example, a chicken dinner at a restaurant might include two chicken breasts instead of one.

Overeating is half of the problem. The other half is not getting enough exercise. Think about your own exercise. Do you get car rides to places that you can walk to instead? Do you grab the cell phone to keep in touch with friends instead of hopping on your bike to visit them? How much time do you spend watching television, playing video games, and e-mailing on the computer? Now, how much time do you spend playing sports, roller blading, or getting other exercise?

The way to avoid obesity or to fight it is to eat less and exercise more. For someone who is obese, that is easier said than done. But you can help keep a healthy weight or work toward a healthy weight by making these smart choices:

• Choose smaller portions of food. Put one scoop of mashed potatoes on your plate instead of two. Chances are, the smaller portions will satisfy your hunger as much as the larger portions.

• Choose less fatty foods when you can. If a grilled chicken sandwich comes with fries or fruit, choose the fruit.

• Add more exercise to your day. Try to get at least 30 minutes a day.

Starting good health habits now will lead to better health your whole life.

Look at the table below, and answer the following questions.

	Height	Weight
Person A	5′8″	100 lbs
Person B	5′2″	170 lbs
Person C	5′6″	140 lbs

1. Which person do you think is overweight?

_____

2. Which person do you think is underweight?

_____

3. Which person do you think has the healthiest weight?

_____

How Can Kids Prevent Obesity?

It is much easier to prevent obesity than it is to take the weight off once it has been gained. Obesity in children and adolescents has two primary causes—overeating and not exercising enough. Both causes may be rooted in a third cause—television watching. Why? Television commercials show food and drink ads constantly. Most of these ads do not show food that is healthy food. Fast food, in general, has much more fat, calories, and sodium than food you make yourself. Soft drinks are *empty calories*—They have no nutritional value. At the same time, the act of watching television keeps young people from engaging in healthier activities, such as sports, walking, or riding a bike.

1. The average child in America watches about 10,000 food and drink commercials a year. How do you think this affects obesity?

_____

_____

_____

2. "Mindless eating" is eating something because it is there, not because you are hungry. Describe a time when you eat mindlessly. What are you doing at that time?

_____

_____

_____

3. Many schools are cutting back on physical education classes. For example, a school might have PE class twice a week instead of every day. Do you agree with this trend? Give your reasons.

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_____

_____

What's a Serving Size?

GOAL

To accurately describe the sizes of one serving of various foods

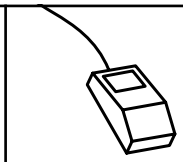
MATERIALS

You will need a pencil and paper.

PROCEDURE

The picture shows the serving sizes of some foods as recommended by the American Dietetic Association. The picture compares the food portions to common objects. For example, one serving of cheese is about the size of a domino.

1. Look at each item in the picture to become familiar with the recommended serving sizes of certain foods.
2. Think of at least two more objects that are about the same size to one serving of each of the foods listed in the chart.

				
1 serving of cheese	1 serving of pasta	1 serving of potato	1 serving of butter	1 serving of fruit

RECORD KEEPING: Use a table like the one below to record objects that are about the same size as one serving of the foods listed.

Food	Object	Object
Steak		
Potato		
Cheese		
Butter		
Fruit		
Burrito		
Pasta		

CONCLUSIONS: How do the serving sizes of foods shown in this activity compare to your previous ideas of serving sizes?

APPLICATION: Suppose you order a meal in a restaurant and the food portions are much larger than shown here. What could you do if you wanted to eat healthy portions?

Activity 1

Decisions About Risk Factors

You know a lot about how to be healthy. In fact, you can probably name off the top of your head at least five practices that improve your health. Give it a try.

1. _____

2. _____

3. _____

4. _____

5. _____

So, what did you come up with? You might have listed good eating habits, enough exercise, proper hygiene, and seeking help when you need it. Also, you might have mentioned concentrating on your good characteristics to improve your self-image. Chances are that you or your classmates listed some "don'ts," too, such as don't smoke and don't take drugs.

Of course, knowing how to improve your health and actually doing it are two different things. For example, surveys show that about one quarter of teens smoke. Yet, almost everyone knows that smoking is harmful. Reminders are all around us. More and more offices, restaurants, and other public buildings are forbidding smoking completely. Smoking is no longer allowed on airline flights within the United States. Products to help smokers kick the habit flood the market. Why all the laws and efforts to avoid smoking?

Smoking is a **risk factor**—a behavior that increases the chances of a health problem occurring. One scientific study after another provides increasing evidence of just how deadly a risk factor it is. Consider the following:

- Smokers are up to 24 times more likely than nonsmokers to get lung cancer.
- Smokers are 19 times more likely to get emphysema.

- Smokers are three times more likely to die from a heart attack.
- On average, smokers give up six to nine years of their lives.
- Women who smoke during pregnancy are almost twice as likely to miscarry.
- **Nicotine**—the drug in tobacco—is addictive.

Does this mean that if you smoke, you will automatically get sick? No. But your chances are greatly increased. Suppose as a nonsmoker you had only a 3 percent chance of getting lung cancer. After many years of smoking, you could have a 72 percent chance, meaning you would likely die of lung cancer. Also, studies show that the younger you are when you start smoking, the more likely you are to become a lifetime, heavy smoker at greatest risk.

Yet, about half of teen smokers begin their habit by age 12. Why do they start? Why do they take such a risk with their lives?

- One reason is that people don't know all the facts about the effects of smoking. For example, what information is new to you so far in this lesson?
- Some people start smoking to be accepted in a group and to share the group's experiences. Everyone, especially the young, has a fear of loneliness and a need to belong. Remember, however, that most teens do not smoke. Therefore, by passing on smoking, you show that you are in the majority. You belong to a growing group of health-conscious teens.
- Certain cigarette ads appeal especially to the young. Ads on billboards, displays, and in magazines make smoking look glamorous, fun, or adventurous. Be suspicious of such ads. There's nothing fun about cancer and heart attack. Later on, you'll have a chance to analyze an ad.
- When it comes to risks, young people often feel that they're the exception to the rule. Health problems seem so far away, and they are so busy having fun that they feel indestructible. A young smoker might say, "That won't happen to me," or, "I'll quit in a couple of years." From the information you've read so far, you should realize that serious smoking-related health problems could very well happen to you. And because nicotine is addictive, quitting is much easier said than done.

So, now you know a little more about the dangers of smoking. The decision to avoid this risk factor is yours. Others may try to persuade you to smoke, but no one can really force you. You have power over your life and control over your decisions. What will you decide?

1. The statements below are some facts related to smoking. Which of these facts would you use to decide whether or not to smoke? Write your decision and list the letters of the facts that you used to make that decision. You may have used other information, too. Briefly describe it.

(a) Tobacco companies purposely design ads to appeal to teens.

(b) Smoking has been a common practice in Western countries for more than 400 years.

(c) Nicotine is addictive.

(d) About 25 percent of high school seniors smoke.

(e) Adult smokers get wrinkles sooner than nonsmokers, making them look up to 20 years older.

(f) At least one tobacco company has acknowledged that "cigarette smoking causes health problems, including lung cancer, heart and vascular disease, and emphysema."

(g) Smokers are much more likely than nonsmokers to get cancer of the mouth, pancreas, and esophagus.

(h) Some young people start smoking to cover up feelings of shyness or awkwardness in social situations.

(i) Eighty-seven percent of people who die from lung cancer were smokers.

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2. Find a cigarette ad in a magazine or on a billboard. How does the advertiser try to get a consumer to use the product? Start by writing several words that describe what the ad shows. You might write *rugged, cool, outdoors,* or *fun.* How does this ad affect your decision of whether or not to smoke?

3. How do you feel about smoking?

Observing the Effects of Smoking

GOAL

To observe some of the effects of smoking on a model of the lungs

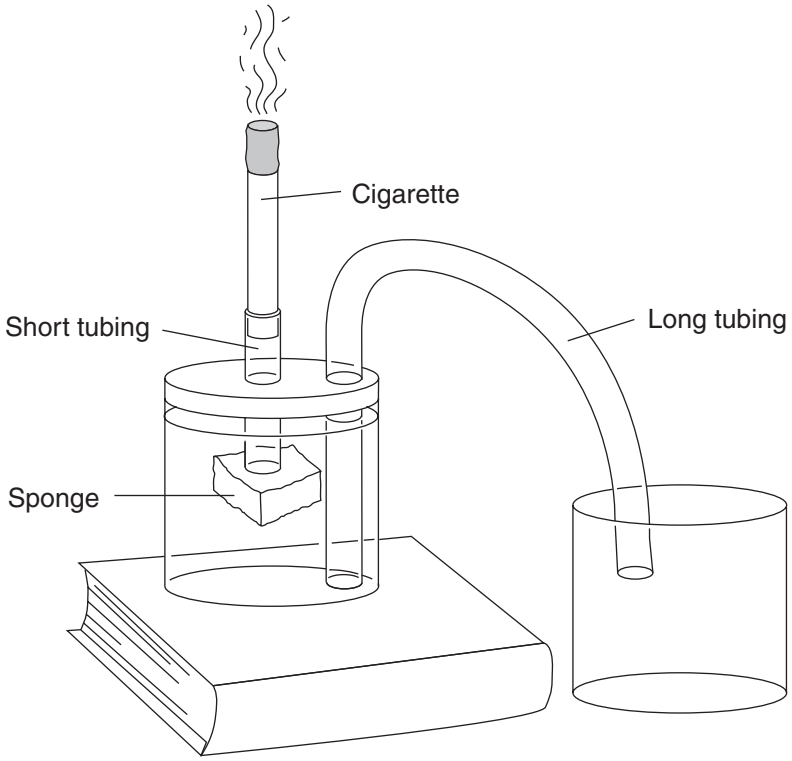
MATERIALS

You will need safety goggles; two large jars and one metal lid; clear plastic tubing 10 cm long; clean, thinner tubing 60 cm long; a small white sponge; rubber cement; a box or a thick book; five cigarettes; matches; water; and a drill.

PROCEDURE

Use the materials to make the setup shown on the right. Ask an adult to help you drill two holes in the lid. Both of you should wear safety goggles.

Suck on the thin tubing so that water starts to flow into the lower jar. Light the cigarette tip. When the higher jar is empty, refill it and empty the lower jar. Repeat these steps until all five cigarettes are "smoked."



RECORD KEEPING: Record how the short tubing and sponge look, smell, and feel after the cigarettes have been "smoked."

CONCLUSIONS: The short tubing and sponge represent your lungs. What does this activity show you about smoking?

APPLICATION: Does this activity change your view of smoking? Explain.

Using Information to Make Decisions

Below are some facts related to secondhand smoke, which is smoke from a burning cigarette that nonsmokers breathe in. Which of these facts would you use to decide whether to move away from a nearby smoker in a restaurant? Write your decision and list the letters of the facts that you used to make that decision. You may have used other information, too. Describe it.

(a) Smoke from a burning cigarette releases nicotine into the air.
(b) Smoke from a burning cigarette releases carbon dioxide into the air.
(c) Cigarettes are expensive.
(d) Breathing in secondhand smoke can raise a person's blood pressure.
(e) Chewing smokeless tobacco stains the teeth and can cause cancer of the mouth.
(f) Most restaurants have a nonsmoking section.
(g) Smoking is not allowed on airline flights within the United States.
(h) Breathing in secondhand smoke increases the amount of poisonous carbon monoxide in the lungs.
(i) Smokers often have deep, hacking coughs.

Decision

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