Walch Science Literacy Series
Health

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(R) denotes reproducible activity

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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 each other
- 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.

Communications 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.

Lesson 15

My Best Friend Is a Diabetic

Teacher Lesson Page

Science Literacy Skills

- Locate information in reference books, newspapers, magazines, CDs, databases, and the Internet
- Write and illustrate instructions for carrying out a procedure
- Read tables and graphs

Vocabulary

diabetes **insulin**
glucose **pancreas**

Background: What Causes Diabetes?

The causes of **diabetes** are not fully understood, but the disease seems to be genetic since it tends to run in families. However, only a small proportion of those who inherit the gene responsible for Type I diabetes actually develop the disease. The development of diabetes may be the result of a viral infection that damaged the **pancreas** years before.

No matter what the initial cause, Type I diabetes results from the destruction of the **insulin**-producing clumps of cells, called the islets of Langerhans, in the pancreas. The body's own immune system produces antibodies that mistake the islets as foreign invaders and destroy them.

Type II diabetes is also a genetic disease. But whether a person actually develops it is greatly influenced by diet and weight. Between 80 and 90 percent of Type II diabetics are obese.

For Discussion

Ask students to locate the pancreas on a diagram of the human body. Then ask what the jobs of the pancreas are. (It provides digestive juices for the intestine and produces insulin.) Ask how the pancreas is related to diabetes. Encourage students to discuss what they think diabetes is. Write their suggestions on the board and review the ideas as students read the lesson.

Encouraging Skill Development

Students develop an understanding of and appreciation for the special medical needs that some people have. Ask students if they know anyone who has allergies. Ask what special precautions or actions the person must take on a daily basis, especially during certain times of the year. Do the allergies prevent him or her from doing certain things? Relate students' discussion of allergies to the more acute condition of diabetes.

Library Research
Debilitating Diseases

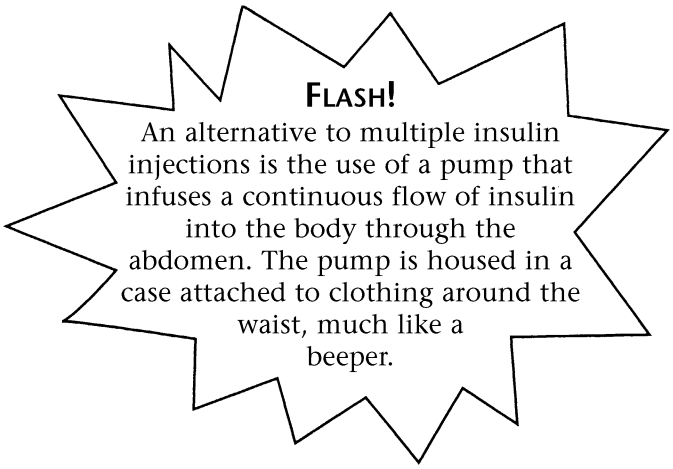
(Small group)

Assign groups to investigate the causes, treatments, and effects of one of these conditions on a teenager's life and also coping methods. Then have groups present their reports as skits.

1. asthma
2. epilepsy
3. kidney disease
4. scoliosis

Extension

Invite students to continue the story of Steve begun in the student book. Their continuing stories might include how Steve handles another dining situation now that his friends are aware of his condition.



Answers to Questions in Student Book

1. Insulin is needed to help body cells take in glucose from the blood. A Type I diabetic does not produce enough insulin naturally to do this job.

2. Answers will vary but may refer to Steve's frustration with his condition and his temporary refusal to deal with it.

3. Answers may include anticipating going out after the game and adjusting his eating habits and insulin accordingly for that day, having only one piece of pizza and a sugar-free soft drink, going along with the group but not eating anything.

4. Answers may include being more forceful in trying to convince Steve not to overeat.

5. He could find out what to expect on the outing, such as what physical activity and foods will be involved. He could then adjust his daily activities, diet, and insulin intake accordingly.

Teacher's Notes on Reproducible Activity

The game board provided is one of many possible configurations. Students may choose to develop their own, but they should include space for testing blood and taking insulin, all meals and snacks, and a couple of events throughout the day. Encourage students to create other cards to add to the deck. Students will find it easier to use the game board and cards if they glue them to thin cardboard. Students may need help using the Food Exchange Chart to create meals for the Meal cards.

Answers to Reproducible Activity

Conclusions: Students' paragraphs should reflect the idea that a diabetic's day is filled with decision making and is often frustrating.

Answers to Assessment Activity

Students' meals will vary. They should realize that the Exchange Chart is a helpful tool that can be used to create healthful meals that satisfy everyone's tastes. Total calorie intake for this particular chart should be about 2000, give or take 100.

Planning a Day in the Life of a Diabetic Teen

GOAL

To understand how special medical needs affect the daily lives of diabetics

MATERIALS

You will need a Food Exchange Chart, the Game Board, the Event cards, and the Meal cards. In addition, you will need a game die, a game piece such as a coin, scissors, and a marker.

PROCEDURE

1. Cut out the Meal and Event cards. Write "Meal" or "Event" on the back of each card.
2. Play with two or three players. Take turns using the die and game pieces to travel around the board. The spaces on the board represent a day in the life of a teenage diabetic. Follow directions on the board spaces.
3. When you land on an Event space, take an Event card and read it aloud. All players should discuss and come up with one answer. One player should write down the answer so that it can be compared with the answers of other groups later.
4. When you land on a Meal space, take a Meal card. All players should use the Food Exchange Chart to create a meal according to the directions on the card. Again, one player should write down this meal to compare with the meals of other groups. The exchanges on the Meal cards are for a 2000-calorie per day diet. You should try to keep the daily intake of calories to within 100 calories of this figure. Play until all players finish the board.

RECORD KEEPING: Each group of players should record their answers to Event card questions as well as food suggestions for the Meal cards. If the group cannot agree on one answer or set of foods, write down substitutes.

CONCLUSIONS: Write a paragraph explaining what this game has shown you about the daily life of a diabetic.

APPLICATION: Make a board game titled A Day in My Life. You can use this board game as a model. Create game spaces and cards with events suitable to your life. You might include any medical needs you have.

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Planning a Day in the Life of a Diabetic Teen (continued)

Food Exchange Chart					
Milk	**Amount**	**Calories**	**Fat**	**Amount**	**Calories**
Buttermilk	1 cup	80	Bacon	1 slice	45
Skim milk	1 cup	80	Butter or margarine	1 tsp	45
1% milk	1 cup	107	Cream cheese	1 tsp	45
2% milk	1 cup	125	Dressing	1 tsp	45
Whole milk	1 cup	170	Nuts	6	45
Yogurt, plain, skim	1 cup	80	Oil	1 tsp	45
Meat	**Amount**	**Calories**	**Bread**	**Amount**	**Calories**
Cheese	1 oz	73	Bread	1 slice	70
Egg	1	73	bagel	½	70
Fish, white	1 oz	73	bun or roll	½	70
seafood	5 small	73	Cereal	¾ cup	70
canned	¼ cup	73	Crackers	6	70
Meat or poultry	1 oz	73	Pasta	½ cup	70
cold cuts	1 slice	73	Popcorn, unbuttered	1½ cups	70
hot dogs	1	73	Pretzels	6	70
Peanut butter	2 tbsp	73	Rice	½ cup	70
Vegetable	**Amount**	**Calories**	**Fruit**	**Amount**	**Calories**
Beans, baked	¼ cup	70	Apple	1	40
green or yellow	½ cup	25	Banana	½	40
Broccoli	½ cup	25	Cantaloupe	¼	40
Carrots	½ cup	25	Cherries	10	40
Celery	½ cup	25	Grapefruit	½	40
Corn	½ cup	70	Grapes	12	40
Lettuce	½ cup	25	Orange	1	40
Onions	½ cup	25	Peach	1	40
Peas	½ cup	70	Pear	1	40
Potatoes	1	70	Pineapple	½ cup	40
Spinach	½ cup	25	Plums	2	40
Tomatoes	½ cup	25	Raisins	2 tbsp	40
Zucchini	½ cup	25	Strawberries	¾ cup	40

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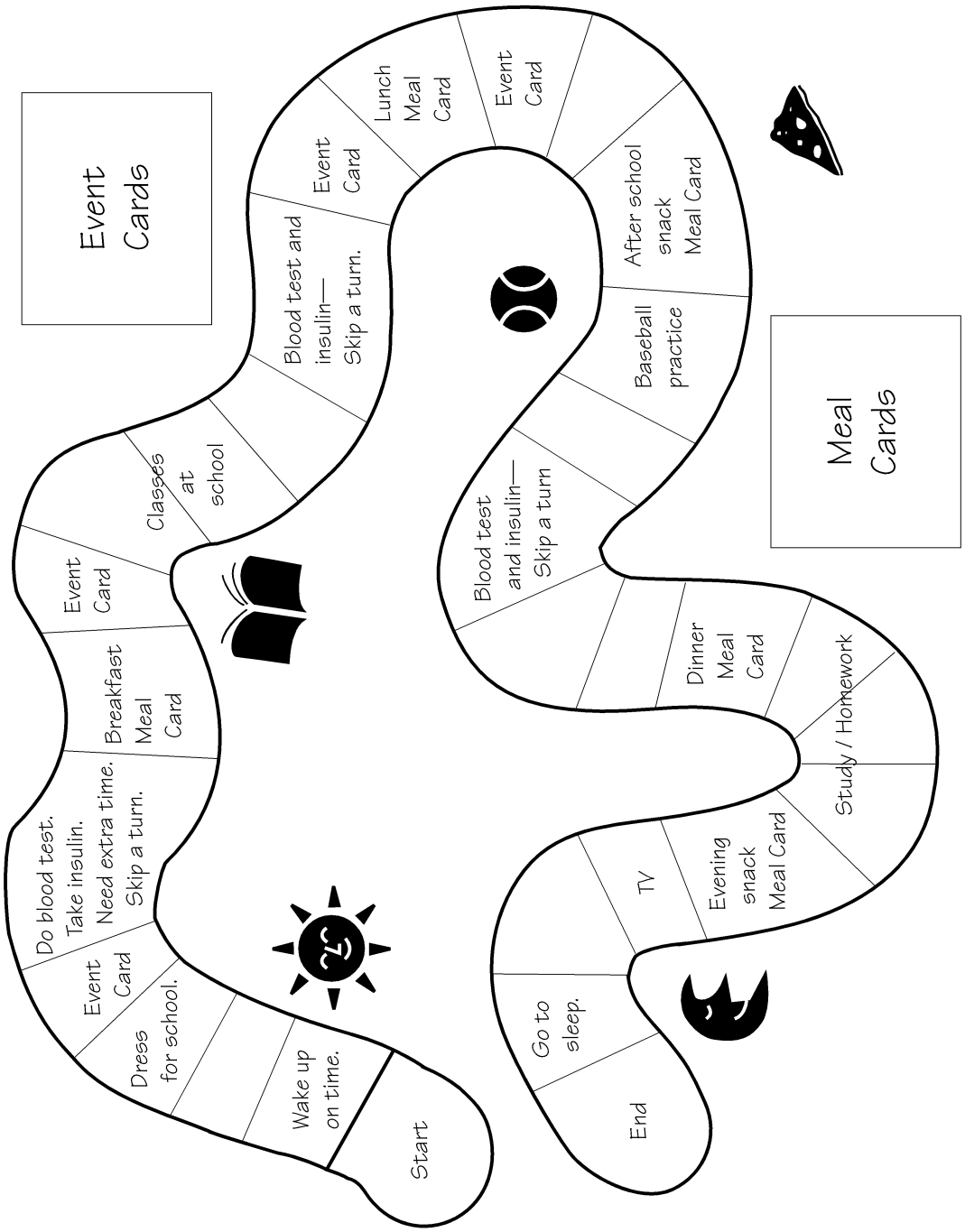
Planning a Day in the Life of a Diabetic Teen (continued)

GAME BOARD



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Planning a Day in the Life of a Diabetic Teen (continued)

Event Cards

Woke up late today. No breakfast. What do you do now?	Sports injury. Need an emergency room visit. What do you tell the doctor?	Prom night is approaching. How might prom activities affect your routine?
Ran out of insulin. How does this affect your morning?	Detention after school. Delays your snack. What problem does this present?	New friend makes you a huge banana split. How do you handle this?
The baseball team is going out for something to eat after practice. What do you do?		Strenuous workout at practice today. Blood sugar getting too low. What are the symptoms? How can you correct this?

Meal Cards

Breakfast 1 protein exchange 2 bread exchanges 1 milk exchange 1 fruit/vegetable exchange 2 fat exchanges	**Lunch** 3 protein exchanges 2 bread exchanges 1 vegetable exchange 2 fat exchanges 1 milk exchange	**Dinner** 4 protein exchanges 1 vegetable exchange 3 bread/starch exchanges 2 fat exchanges
After School Snack 1 fruit exchange	**Evening Snack** 1 bread exchange 2 fat exchanges	

Using a Food Exchange Chart

Use the Food Exchange Chart and the Meal Cards that you used in the activity to create meals different from the ones you created in the activity. Include a breakfast, a lunch, a dinner, and a snack. Keep the total amount of calories to about 2000. Fill in the chart below with your meal items.

Breakfast	**Calories**

Lunch	**Calories**

Dinner	**Calories**

Snack	**Calories**