

## RISK PERCEPTION AND JUDGMENT

### Purpose:

This lesson introduces the concept that every human activity involves some degree of risk.

### Concepts:

1. Risk has many dimensions.
2. Every human activity involves some degree of risk.
3. In making decisions about managing nuclear waste, public risk perception and distribution of risk must be considered.
4. Both risk management and risk assessment are important aspects of the waste management program.

### Duration of Lesson:

Two 50-minute class periods

### Objectives:

As a result of participation in this lesson, the learner will be able to:

1. explain why he/she ranked the various items on the risk activity as he/she did;
2. discuss risk and what can be done to reduce it in his/her own life; and
3. discuss both positive and negative results of risk management limitations.

### Optional Objectives:

As a result of participation in the computer activity *Risk Perception*, the learner will be able to:

1. rank the 30 items on the diskette in accordance with his/her perception of degree of risk involved in each;
2. compare his/her ranking with that of the class as a whole and with rankings done by four other groups; and
3. speculate about why the rankings differ.

### Skills:

Critical thinking, discussing, ranking given items

### Vocabulary:

Distribution of risk, judgment, risk assessment, risk management, risk perception, trade-off

**Materials:**

Activity Sheet

*Risk*, p. 61

Transparency

*Ordering of Perceived Risk*, p. 49

Computer Diskette

*Risk Perception and Judgment* (Order free of charge from the OCRWM National Information Center, 1-800-225-6972; within Washington, DC, 488-6720) (Available for IBM or IBM compatible PCs.)

Background Notes

*Risk Perception and Judgment*, p. 25

*The Debate About Risk*, p. 26

**Suggested Procedure:**

1. Before passing out student copies of the activity entitled *Risk*, it may be helpful to explain to students that the activity they are going to be working on is an adaptation of a study conducted on risk perception in 1976. This particular study involved questioning four different groups of people. Three groups were from Eugene, Oregon; they included 30 college students, 40 members of the League of Women Voters, and 25 business and professional members of a group called the Active Club, which is a community service organization. The fourth group consisted of 15 persons selected nationwide for their professional involvement in risk assessment. This particular group of experts included a geographer, an environmental policy analyst, an economist, a lawyer, a biologist, a biochemist, and a government regulator of hazardous materials.

Participants in this study rated 30 activities, substances, and technologies according to the present risk of death from each. These people were asked to consider the risk of dying (not just to themselves, but to anyone in society in general) as a consequence of the activity or technology being considered.

The four groups of participants were given 30 index cards upon which a particular activity, substance, or technology was written. They were told to study the 30 items individually, thinking of all the possible ways someone might die from each. The next step was to order the items from least to most risky and then assign a numerical risk value to each by giving a rating of 10 to the least risky and making the other ratings accordingly. Respondents were given additional suggestions, clarifications, and encouragement to do as accurate a job as possible.

The activity your students will engage in has been modified to make it more appropriate for classroom use. The modifications will influence results. Student interest should be piqued by comparing their results to the results of the other groups mentioned above. It is important that they understand that their results have been influenced by the modifications made in order to adapt the activity for classroom use. Students should also be aware that the table shown in the transparency is based on a very limited sampling.

Additionally, it might be well to remind students that this study was conducted in 1976 and they should keep in mind while comparing responses that a great deal has happened and many things

have changed since 1976 which cannot help but influence responses.

2. After allowing approximately 15 minutes for students to complete the activity, ask students to list their two most risky choices and their two least risky choices and write a few sentences explaining the rationale for their rankings.
3. Discuss student choices. You may wish to begin this discussion by pointing out that many authors prefer the term *judgment* to *perception*. Experts' and laypersons' assessments of risk both constitute judgments. But the separate groups may consider different factors to be relevant. (Perhaps students can better appreciate the last point if they are reminded that sometimes they and their parents have opinions that are divergent, at least in part because different factors are considered important.) Then discuss the question listed below.

### Sample Discussion Questions:

- a) What items did you rank high? Low? Why?
- b) What do you think are the risks associated with the activities or technologies in the exercise? The benefits? What does the term "trade-off" mean? Why is the term "trade-off" often used in reference to risks and benefits of technologies?
- c) What are the costs of reducing risk for the activities in this exercise? The benefits? (Do not limit your definition of cost to money. Consider such things as societal and environmental costs also.)
- d) What can be done to reduce risk in our lives? What should be done to reduce risk in our lives? Should all methods be used? What should the role of the government be?
- e) Do you think some level of risk in our lives is acceptable? Why or why not?
- f) How should decisions to determine levels of acceptable risk be made? What should the role of the government be?
- g) Should everyone be made to reduce his or her personal risk in activities? Should there be penalties if people don't? Are there examples in your life where this is occurring? Can you think of instances mentioned in the news? How do you feel about it?
- h) What are some of the risks you face in your life? What could you do to reduce risk in your own life?
- i) How has the development of technology affected risk? (Be sure to discuss both positive and negative effects.)
- j) How can we measure risk?
- k) Generally, making decisions about technology involves risk management. Risk management involves both (1) providing for safety (e.g., the design of technology, laws and regulations that affect design and operation, ensuring workers are properly qualified, plans made in case challenges should occur, etc.), and (2) striving for consensus in situations where people disagree about the riskiness of the technology or whether or where facilities should be

constructed. Risk estimates are determined as part of a process called risk assessment. What are the positive results of risk management? What are the limitations of risk management?

(Performing risk assessment requires technical professionals, such as scientists and engineers, to identify challenges associated with the technology they are working on. After challenges are identified, ways of addressing the challenge can also be identified so as to provide safety. However, risk assessment cannot represent absolute truth. There is an inevitable element of judgment that selects or ignores particular aspects of a challenge being studied. These judgmental elements are incorporated into modeling and technical calculations and thus affect the knowledge that is produced.)

- l) Explain the application of risk management to something you are familiar with, such as the automobile or sports. Does risk management guarantee absolute safety?

*(For automobiles students may identify traffic laws, auto and highway design, driving lessons, etc. For sports they may identify such things as rules, equipment, coaching, etc.)*

Following the discussion of the above questions, show students the transparency *Ordering of Perceived Risk*. (This list is taken by permission from "Perception of Risk," Paul Slovic, Vol. 236, pp. 280-285, Table 1, *Science*, April 17, 1987.) Ask students to compare their ranking with the rankings listed and speculate as to why the rankings are different.

If you have access to computers in your school or classroom, you may wish to make use of the computer diskette provided with this unit of study. This diskette can be used in conjunction with the written activity on risk. Students engage in the same ranking required by the risk activity; however, they receive immediate feedback relative to how their classmates and others have ranked each item on the activity. Specific instructions are included in this Teacher Guide.

- m) Which activities or technologies were ranked about the same by all four groups? Why do you think this happened? Which ones were ranked very differently? Why? As part of this discussion, have students identify events that have occurred since 1976 when the other rankings were done. These events may have influenced their personal or class rankings.
- n) How do you think each group "measured" risk?
- o) What do you think is the significance of the fact that the different groups rank these items differently? Does this mean that the "experts" are right and the other groups are wrong? Of what importance is understanding that different groups see risk differently? How do you think we should deal with these differences in our democracy?

Have students write a short paragraph explaining the significance of this lesson to them.

The computer program, student activities, and some teacher notes for the lessons on risk are based on information used by permission from "Facts and Fears: Understanding Perceived Risk" by P. Slovic, B. Fischhoff, and S. Lichtenstein, in *Societal Risk Assessment: How Safe is Safe Enough*, published by Plenum Publishing Corporation, New York, 1980.

**Teacher Evaluation of Learner Performance:**

Participation in class discussion, completion of the activity sheet entitled *Risk* and completion of the assigned paragraph explaining the significance of this lesson to them will indicate level of comprehension.

**Enrichment:**

*Probability: the Language of Risk Assessment*, pp. 65, 66  
Reading Lesson and Activity

*Factors Affecting Risk Judgments*, p. 67  
Activity

Read the following quotations, then consider and discuss just how one decides which experts to believe when opinions are divergent. Do you think that choosing which experts to believe should be a political decision? Why or why not?

" 'Shipping high-level nuclear materials across the country to Yucca Mountain is not a gamble the public should allow the Department of Energy to take,' said the author of several books criticizing America's radioactive waste policies.' They should leave that kind of risk taking to the casinos,' said Marvin Resnikoff, a New York physicist and radioactive waste management consultant. 'Let them roll that kind of dice in the casinos and not on our highways.' " (Review-Journal, Las Vegas, Nevada 4/24/90)

" To date, most accidents and leakages in transit have involved low-level wastes, and no deaths or serious injuries have been traced to them. In fact, compared to transport of other hazardous materials, radioactive shipments have an excellent record...." (*The Nuclear Waste Primer, A Handbook for Citizens*. The League of Women Voters Education Fund, OCRWM National Information Center, Washington, DC, 1993)