

Instructor Notes

Perceived Risks

Public perceptions of risks are often at odds with those of professional risk analysts, who frequently claim that the general public tends to exaggerate low-risk processes and activities and underrate more mundane, riskier activities. However, recent studies have shown that public perception of risk is not based as much on ignorance as it is on a broader notion of risk. People tend to fear risks that are uncontrollable and unobservable more than mundane and voluntary risks—even if the latter are demonstrably higher.



The activity is written for workshop participants and may need modification for classroom use.

Suggested Background Reading

- A Scientific View of Risk

National Science Education Standards for Grades 5–12

Science As Inquiry

- Abilities Necessary to Do Scientific Inquiry
Formulate and revise scientific explanations using logic and evidence. After ranking a list of everyday hazards according to their perceived risks, students discuss these personal perceptions with a group and formulate a new ranking that reflects the group's risk perceptions.

Recognize and analyze alternative explanations and models. Students further evaluate the list of everyday hazards by ranking their controllability and observability and mapping the results. Students learn to review current understanding, weigh the evidence, and examine the logic while analyzing alternative ranking systems.

Communicate and defend a scientific argument. During group and class discussions on the perceived risks of everyday hazards, students learn to express concepts, review information, use language appropriately, develop charts, speak clearly and logically, construct a reasoned argument, and respond appropriately to critical comments.

Science in Personal and Social Perspectives

- Natural and Human-Induced Hazards
Natural and human-induced hazards present the need for humans to assess potential danger and risk. Students discuss the costs and trade-offs of various health and environmental hazards and learn that people tend to fear risks that are uncontrollable and unobservable more than risks that are mundane and voluntary.

Procedure Notes and Outcomes

Assign each group (of no more than four participants) one table of hazards from the Perceived Risks Data Sheet. Feel free to assign the same hazard table to more than one group. In Task 1, be sure to allow participants to rank the risks on their own before discussing the risks with their group and completing the remainder of the exercise. You may want to stop the class after Task 2 and have individuals report their results to the class. It is often interesting to compare two different groups' rankings of the same set of data. In Task 5, it can be helpful to map each group's risks on a piece of posterboard and post them for the class to make comparisons. Risks plotted in the upper-right quadrant of the graph usually provoke the most public outrage and fear; they are also the risks on which people are most likely to demand government action.

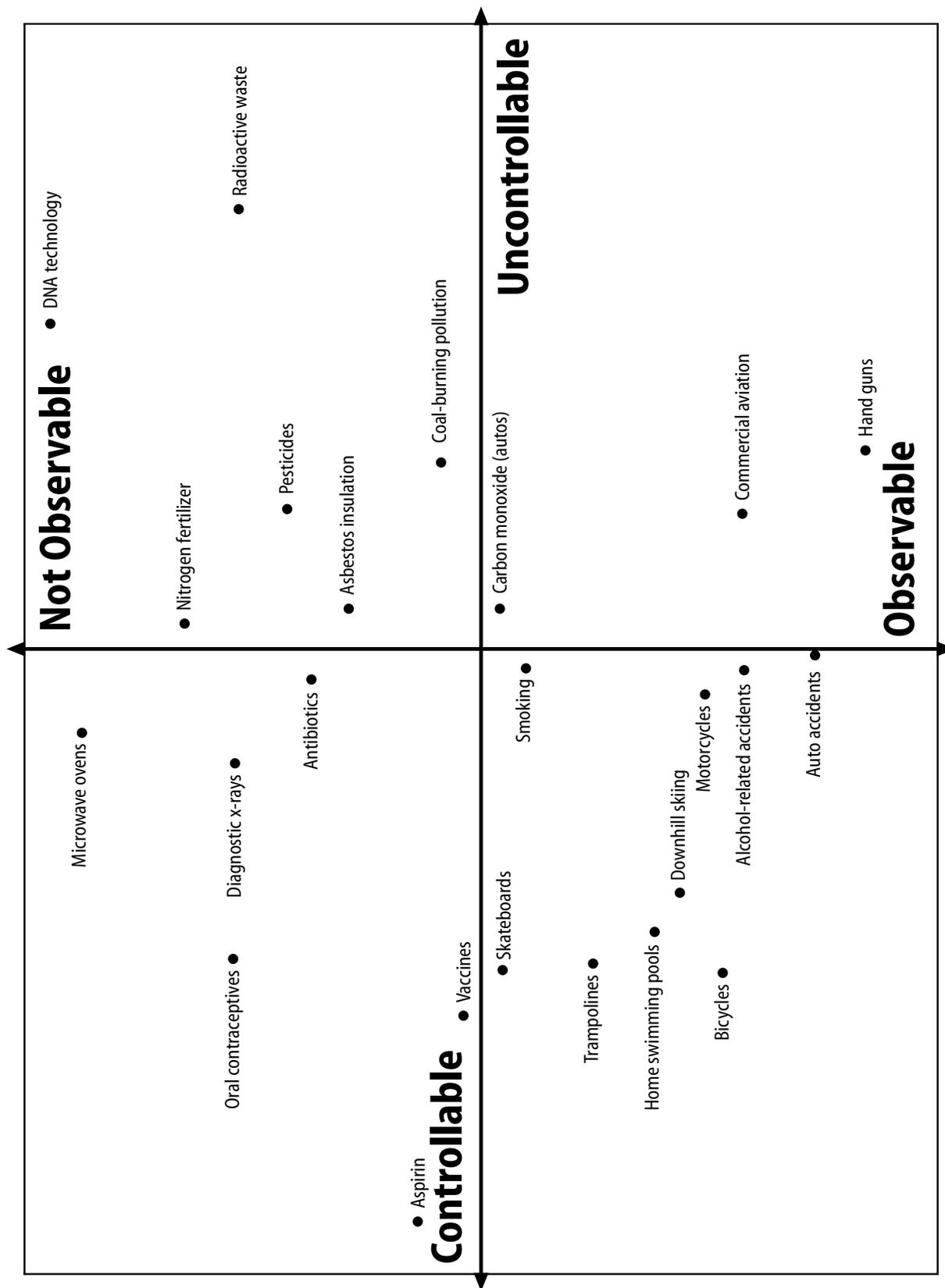
Sample Data

You may wish to show an overhead of the chart on the following page that is adapted from the 1993 Morgan article. (See References.) Use it to compare sample data with the class results.

References

Ost, D. "Perceived Risks," *American Biology Teacher*. 1995, 57 (4), 235.

Morgan, M.G. "Risk Analysis and Management," *Scientific American*. 1993, 269 (1), 32–41.



Activity Instructions

Perceived Risks

In this activity, first you will rank a list of everyday risks and compare your responses with those of other participants. Then, as a group exercise, you will rate each risk on both its ability to be controlled and its observability in the environment. In the final step of the activity, you will graph your group's responses for a visual comparison of how different individuals perceive everyday risks.

Procedure

Task 1: Personal Perceptions

On your own, rank the hazards according to your perception of the risk to health, safety, and/or the environment associated with each. For example, the hazard with the **highest risk** will be #1, the **second highest risk** will be #2, and so on. Assign each number to only one risk. Record your ranking in Column A of the Perceived Risks Data Sheet.

Task 2: Determining Consensus

Discuss the hazard items in your group. Share the reasons why you ranked the hazard as you did. By consensus, establish a new rank order for the items that reflects the group's perception. Record the rank order obtained by consensus in Column B of the Data Sheet.

Task 3: Controllability

A second part of the decision framework involves a different set of perceptions. In your group, classify each hazard on a continuum ranging from -5 (controllable) to +5 (uncontrollable). Record your classifications for this task in Column C of the Data Sheet. Use values from -5 (best example of the following characteristics) to 0 (weak example) for hazards that are

- controllable,
- not global or catastrophic and do not have fatal consequences,
- a risk to future generations that can be easily reduced, and
- decreasing in frequency.

Assign values from 0 (weak example) to +5 (best example of the following characteristics) for hazards that

- are uncontrollable,
- generate a high degree of fear,
- hold potential consequences with high risk to future generations, and
- are increasing in frequency.

Task 4: Observability

In your group, classify each item on a continuum as you did in Task 3 but this time in terms of observability. Record your scale values in Column D of the Data Sheet. The decision framework you will use to classify the hazards involves a variety of characteristics. Use a scale ranging from -5 (observable, well-known risk) to $+5$ (unobservable, unknown risk).

Use values from -5 (best example of the following characteristics) to 0 (weak example) for hazards that

- are observable,
- are known to those who are exposed,
- have an immediate effect on persons or the environment, and
- are old risks that are well known to science and society.

The hazards or technologies that you feel are the least well known should be classified at the other end of the continuum. Use values from 0 (weak example) to $+5$ (best example of the following characteristics) for hazards that

- are not observable,
- are unknown to those individuals that might be exposed,
- seem to have a delayed effect, and
- are new risks or risks unknown to science.

Task 5: Mapping Perceived Risks

Using the rankings and assigned values on your table, “map” all the hazards on the Risk Space Handout. Graph Column C on the x axis and Column D on the y axis, so (C,D) is an ordered pair.

For example, suppose you classified **home swimming pools** as -2.5 (for their controllable risk and effects) in Task 3. You would measure across the horizontal axis -2.5 units (to the left of the $0,0$ point). If you rated the pools as -2.0 on the observable scale (vertical axis), then you would move down the vertical axis 2.0 units. The point for home swimming pools would be in the lower-left quadrant of the Risk Space Handout at the point $(-2.5, -2.0)$. This would be interpreted as a hazard with a relatively low perceived risk.

Data Sheet

Perceived Risks

Table 1				
A: Individual Ranking	Hazard	B: Consensus Ranking	C: Controllability	D: Observability
	Microwave ovens			
	Auto accidents			
	Trampolines			
	Antibiotics (microbial resistance)			
	Hand guns			
	Nitrogen fertilizer			
	Motorcycles			
	Asbestos insulation			

Table 2				
A: Individual Ranking	Hazard	B: Consensus Ranking	C: Controllability	D: Observability
	Aspirin			
	Bicycles			
	Alcohol-related accidents			
	Diagnostic x-rays			
	Pesticides			
	Oral contraceptives			
	Smoking			
	DNA technology			

Table 3				
A: Individual Ranking	Hazard	B: Consensus Ranking	C: Controllability	D: Observability
	Commercial aviation			
	Home swimming pools			
	Vaccines			
	Coal-burning pollution			
	Skateboards			
	Downhill skiing			
	Carbon monoxide (Autos)			
	Radioactive waste			

Risk Space Handout

Perceived Risks

