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Hydroville Curriculum Project

## Dictionary of Evaluation Scales

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Scale Name: *Quality of Explanations*  
Scale Code: **EXPLAIN**

Scale Rationale and Measurement Concept:

An important component of problem solving using environmental health science principles is the ability to distinguish between the quality of various explanations that could be hypothesized to account for an observed health effect. In daily life, health effects are often reported as newspaper or media accounts. The *EXPLAIN* scale uses a media-style reporting of a health effect in the fictitious town of “Mayville” as the background for an evaluation exercise in which students judge the relative quality of each of a number of possible explanations. The set of explanations is based on factors that relate to differences in community contexts, potential exposures to environmental contaminants, and individual susceptibilities to health effects.

Number of Items: 10

Scale Definition: A higher scale score indicates a higher evaluation of the “goodness of explanations in accounting for why Mayville has more cases of serious illness than other town.”

Scale Rating Categories:

- A. Not A Good Explanation
- B. Slightly Good Explanation
- C. Moderately Good Explanation
- D. Very Good Explanation
- E. Don't Know

Task Introduction:

“Imagine that the State Health Department announced today that the small town of Mayville (an imaginary town!) has 10% more cases of serious illness (illness requiring medical attention) than other towns of similar size in your state. As a citizen of Mayville, you are concerned about the announcement. Assume that you have the opportunity to participate in a student citizens’ committee to examine this finding and to understand what, if anything, is different about Mayville.

Listed below are TEN different explanations for why Mayville might have more cases of serious illness than other similar town. For each explanation, decide how well it explains why Mayville has more cases of serious illness than other towns and what might be the causes of the differences.”

Individual Items Comprising *EXPLAIN* Scale:

- Explanation #1: Differences in the use of household chemicals (e.g., household cleaning products, pesticides) between Mayville and other towns.
- Explanation #2: Differences in the use of agricultural chemicals (e.g., herbicides, fertilizers) between Mayville and other towns.

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- Explanation #3: Differences in the lifestyles (e.g., diet, exercise) of the people who live in Mayville and the people who live in other towns.
- Explanation #4: Differences in the types of buildings in which people live and work in Mayville compared to other towns.
- Explanation #5: Differences in the types of businesses and industries in Mayville compared to other towns.
- Explanation #6: Differences in the natural environment (e.g., soils, water, air) of Mayville and the natural environment of other towns.
- Explanation #7: Differences in how well the scientific study was done to determine the number of cases of serious illness in Mayville compared to the studies done in other towns.
- Explanation #8: Differences in how people in Mayville perceive environmental health risks in their town compared to people in other towns.
- Explanation #9: Differences in the geographic location of Mayville compared to other towns.
- Explanation #10: There is no real difference between Mayville and other towns. A 10% difference is so small that it is probably just a matter of chance.

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Scale Name: *Information Seeking*  
Scale Code: **INFOSEEK**

Scale Rationale and Measurement Concept:

Problem solving using environmental health science principles requires the collection and interpretation of information. In doing so, they demonstrate their acquisition of know about environmental health science concepts. The INFOSEEK scale builds on the “Mayville” story problem by posing the context of a community problem solving committee that has an opportunity to collect information. Students judge how information each of a number of activities are for helping the committee accomplish its purpose.

Number of Items: 8

Scale Definition:

A higher scale score indicates a more positive evaluation of how informative an activity would be for “helping solve the problem” of why the community of Mayville has higher incidence of serious illness.

Scale Rating Categories:

- A. Not useful for helping solve the problem
- B. Slightly useful
- C. Somewhat useful
- D. Very useful for helping solve the problem

Task Introduction:

“Suppose that your committee wanted to do your own investigation to determine what could be the cause of people’s illnesses in Mayville. Listed below are a number of things that your committee can do to investigate the cause of illnesses in Mayville that might help inform your committee’s work to solve the problem. Read each one carefully and then indicate how useful it would be for helping solve the problem of why there are more serious illness cases in Mayville than other towns.”

Individual Items Comprising *INFOSEEK* Scale:

- Interview local residents who have been ill in the past year and find out where they work.
- Have a soil test done to determine what chemicals may be in the soil.
- Check the local library for newspaper reports about environmental problems in Mayville.
- Visit some of the larger buildings in Mayville and determine how they are ventilated.
- Check Mayville’s drinking water reports to see if the town’s drinking water has elevated levels of water contaminants.
- Check the Internet for information about causes of serious illness.

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- Determine where Mayville gets its water supply.
- Visit the homes of people were ill and find out how their houses are constructed, heated and cooled.

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Sub-Scale Code: ***INFOSEEK-expert***

Scale Rationale and Measurement Concept:

A central component of the Hydroville Curriculum is the utilization of subject-matter experts to help inform students in the context of problem solving exercises. The INFOSEEK-expert scale builds upon the INFOSEEK scale by assessing how students judge the value of different types of experts, including those from the environmental health sciences, as resources for problem solving.

Number of Items: 3 responses

Scale Definition:

Students chose one expert from each of three lists of experts for a total of three expert choices.

Scale Rating Categories: None

Task Introduction:

“Your committee has additional money to hire experts to help find a solution to the cause of people’s illnesses in Mayville. Listed below are a number of experts. For each list, pick ONE expert that you think would help you the most in your investigation to determine the cause of higher illness in Mayville.”

Individual Items Comprising *INFOSEEK-expert* Scale:

List #1: Pick ONE expert from the list below that you think will help you the most in your investigation of people’s illness in Mayville.

- A. Public Health Nurse
- B. Building Engineer
- C. Toxicologist
- D. Hydrogeologist
- E. Mycologist

List #2:

- A. Occupational Physician
- B. Heating, Ventilation and Air Conditioning Specialist
- C. Epidemiologist
- D. Environmental Engineer
- E. County Building Inspector

List #3:

- A. Emergency Room Physician
- B. Industrial Hygienist
- C. Drinking Water Specialist
- D. Environmental Chemist
- E. High School Science Teacher

Scale Name: *Personal Involvement*  
Scale Code: **PERSINVOLV**

Scale Rationale & Measurement Concept:

Problem solving in the context of environmental health sciences issues often requires social participation, such as public meetings or committees. For students to utilize the environmental health science knowledge gained through the Hydroville Curriculum, they must also have acquired a base of teamwork skills upon which they can draw, and the self-efficacy to utilize those skills in participation with others. The PERSINVOLV scale assesses, through self-evaluation, students' competence and capability with regard to a number of social participation activities in the context of group problem solving.

Number of Items: 6

Scale Definition:

A higher scale score indicates a more positive self-evaluation of how "qualified and capable" students view themselves with respect to a number of different roles and activities that are part of a hypothetical committee problem-solving exercise.

Scale Rating Categories:

- A. Not Qualified and Capable
- B. Slightly Qualified and Capable
- C. Moderately Qualified and Capable
- D. Very Qualified and Capable

Task Introduction:

As part of the student citizens' committee studying the problem in Mayville, you have an opportunity to volunteer for certain jobs on the committee. For each of the following things you can do on the committee, indicate how qualified and capable you think you are:

Individual Items Comprising *PERSINVOLV* Scale:

- Working with others to determine the problem.
- Talking with other community members about the problem.
- Helping to design a scientific investigation of the community.
- Preparing a written report of the committee's findings.
- Presenting an oral report of the committee's findings to a large audience of community members.
- Interviewing a scientist who has specialized knowledge of the problem.

Scale Name: *Intuitive Toxicology*  
Scale Code: **INTUITOX**

Scale Rationale and Measurement Concept:

A core objective of the Hydroville Curriculum is to improve the quality of students' problem solving abilities through interaction with experts in environmental health science. Many of the concepts in environmental health science are complex and some are counterintuitive. A goal of student interaction with curriculum elements and with subject-matter experts is to increase their awareness and understanding of environmental health science and to apply the same reasoning principles as do environmental health scientists to solve problems. The INTUITOX scale assesses student change with respect to a set of concepts in environmental health risk assessment and provides a basis for evaluating the degree to which students develop attitudes about environmental health science that are more consistent with those of science professionals.

Number of Items: 7

Scale Definition:

A higher score on the INTUITOX scale indicate perceptions and attitudes about chemicals and chemical risks that are more consistent with those of science professionals.

Scale Rating Categories:

- A. Strongly Disagree
- B. Disagree
- C. Agree
- D. Strongly Agree
- E. Don't Know

Task Introduction:

“A simple definition of a chemical is any substance that is made up of molecules. Therefore, all forms of matter on earth are made up of chemicals, and chemicals are all around us. Chemicals can occur in nature or can be made by humans. In this survey, when we talk about chemicals we mean industrial chemicals that have been produced for use in commerce, agriculture and various consumer products. These synthetic chemicals include products like plastics, gasoline, pharmaceutical drugs, food additives, cosmetics, fuel and household cleaning products. Pesticides that are used in agriculture and in the home are also chemical products.

The next questions are about your attitudes and perceptions of chemicals in the environment. There are no right or correct answers, only your considered opinions. Read each of the items carefully and give us the best answer you can, given what you know or believe. (Mark one answer for each statement).”

Individual Items Comprising *INTUITOX* Scale:

- If a chemical is released into the environment, then everyone in that environment is exposed to the chemical.
- If a person is exposed to a chemical that can cause cancer in humans, then that person will probably get cancer someday.
- Risks from chemicals usually seem larger to people who don't understand very much about environmental science.
- Making good decisions about things that affect my health and safety, such as chemicals in the environment, is basically just a matter of getting a good feel for what might harm me.
- In general, if a person is not exposed to a hazard then they are not at risk.
- If a person is exposed to a hazard, then they will always experience some degree of harm.
- When it comes to managing risks that affect all of us, such as chemicals in the environment, we should leave the decisions to the experts.

Scale Name: *Self Protection*  
Scale Code: **SELFPRO**

Scale Rationale and Measurement Concept:

Key objectives of the Hydroville Curriculum are for students to develop appropriate increases in self-protective behavior with respect to environmental health and safety risks. The SELFPRO scale assesses student change with respect to self-protective behavior using student perceptions and attitudes toward chemical products in the home, product instructions and warning labels, and other self-protective behaviors in the home.

Number of Items: 13

Scale Definition:

A higher scale score indicates a more positive attitude toward self-protective behaviors with respect to sources of environmental health and safety risk.

Scale Rating Categories:

“The SELFPRO scale is comprised of items using two different response scales. Three of the items use the ‘disagree/agree’ scale shown below. Ten of the items use the “importance” scale shown below.”

Disagree/Agree Scale:

- A. Strongly Disagree
- B. Disagree
- C. Agree
- D. Strongly Agree
- E. Don't Know

Importance Scale:

- A. Never important to me or my family
- B. Seldom important
- C. Important once in a while
- D. Important most of the time
- E. Always important to me or my family

Task Introduction:

Three items are part of the same survey section as the INTUITOX scale. The remaining 10 items use the following task introduction:

“In this part of the survey, we would like you to tell us some things about how you and your family deal with possible health and safety risks in your home. Indicate how important you think it is for you or your family to do each of the following things.”

Individual Items Comprising *SELFPRO* Scale:

Items Using Disagree/Agree Response Scale:

- For most of the chemicals I am exposed to in daily life, including chemicals in the environment, I feel I know how to protect my health and safety.
- For most of the chemicals in the environment, I feel I know how to protect my health and safety.
- I have read and can understand most of the warning labels on chemicals in my home.

Items Using Importance Response Scale:

- Wash fresh fruit and vegetables before eating.
- Read the directions for using household consumer products.
- Read and understand my city's drinking water reports.
- Read product ingredient labels and warning labels for household chemical products.
- Test smoke detectors and replace batteries regularly.
- Replace filters on home heating systems, such as furnaces.
- Use protective equipment such as safety glasses or gloves when recommended.
- Discuss safe use of products with other members of your family.
- Provide adequate ventilation when using chemical products indoors.
- Have my drinking water tested for contaminants.

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Scale Name: *Value for Science*  
Scale Code: **VALUESCI**

Scale Rationale and Measurement Concept:

Acquiring and using environmental health science knowledge both depends upon and contributes to a more positive view of science in daily life as well as a positive view of science as a social enterprise. The *VALUESCI* scale assesses student attitudes toward science in general and with regard to environmental health science in particular, as well as their value for science in making personal health and safety decisions.

Number of Items: 7

Scale Definition:

A higher scale score indicates a more positive value for science in daily life.

Scale Rating Categories:

- A. Strongly Disagree
- B. Disagree
- C. Agree
- D. Strongly Agree
- E. Don't Know

Task Introduction:

“In this part of the survey we are interested in your opinions about science and daily life. Please read each item carefully and indicate whether you agree or disagree.”

Individual Items Comprising *VALUESCI* Scale:

- I feel I know how to use environmental science to help make decisions that protect my health and safety.
- Most topics in science are relatively easy for me to learn.
- I feel confident talking with environmental scientists about their work.
- I am comfortable talking about science with other people like me.
- I am generally interested in new developments in environmental science.
- I feel that I know how to use science to determine when my exposure to chemicals is safe or not.
- Whether or not I get a good job in the future has very little to do with how well I do in my science classes.

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Scale Name: *Perception of Risk*  
Scale Code: **PERCRISK**

Scale Rationale and Measurement Concept:

As students develop increased knowledge skills and conceptual awareness of environmental health science, their perception of environmental health science risks should change with respect to other risks and hazards. The *RISKPERC* scale assesses change in students' perceptions of a broad range of health and safety risks, including those identified by environmental health science.

Number of Items: 10

Scale Definition:

A higher scale score indicates greater perceived risk.

Scale Rating Categories:

- A. No Risk
- B. Slight Risk
- C. Moderate Risk
- D. High Risk
- E. Don't Know

Task Introduction:

“Listed below are a number of risks and hazards to people’s health and safety. Indicate for each one how much of a risk it poses to you and your family.”

Individual Items Comprising *RISKPERC* Scale:

- Automobiles: Driving, riding or as a pedestrian.
- Indoor Air Pollutants: Biological or chemical pollutants found in indoor air of homes or schools.
- Household Cleaning Products: Chemical products used in the home or workplace for cleaning.
- Second-hand (other people’s) cigarette smoke.
- Radiation from the environment.
- Water Contaminants: Naturally occurring or synthetic chemicals that can be detected in drinking water.
- Infectious Diseases: Viruses and Bacteria that can cause diseases like West Nile virus, Flu, SARS or food poisoning.
- Environmental Allergens: Biological pollutants like molds, bacteria, dust mites, animal dander, or cockroach body parts.

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- Food Additives: Chemicals to help processed food stay fresh longer and taste better.
- Alcoholic Beverages.

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Scale Names: Perception of Chemical Risks, Perception of Environmental Risks  
Scale Codes: **CHEMRISK and ENVIRORISK**

Scale Rationale and Measurement Concept:

The Hydroville Curriculum addresses risk assessment in general as well as risk assessment as part of environmental health science. Chemical risks comprise a major category of concern for environmental health sciences, as well as one of the largest categories of hazards in the home. The CHEMRISK scale assess student change in perception of chemical risks. The scale is constructed from a subset of items that are part of the PERCRISK scale as well as three additional items that reflect students' general perceptions chemicals and their risks.

Number of Items: CHEMRISK = 3; ENVIRORISK = 3

Scale Definition:

A higher scale score indicates greater perceived risk from chemicals (CHEMRISK) and from environmental pollutants (ENVIRORISK).

Scale Rating Categories:

Scale ratings are made according to the formats for the PERCRISK scale.

Task Introduction:

The task introduction is that for the PERCRISK scale.

Individual Items Comprising *CHEMRISK* Scale:

- Perceived risk of: Household Cleaning Products
- Perceived risk of: Second-hand Cigarette Smoke
- Perceived risk of: Food Additives

Individual items comprising the *ENVIRORISK* Scale:

- Perceived risk of: Indoor Air Pollutants
- Perceived risk of: Environmental Allergens
- Perceived risk of: Water Contaminants

**SPECIAL NOTE:** The original CHEMRISK scale (Pesticide Spill & MIO) used a subset of items from the Perception of Chemical Risk section. This subset is no longer included.