

Understanding Alcohol:

Investigations into
Biology and
Behavior

**NIH Curriculum
Supplement Series**
Grades 7-8

**National Institutes
of Health**

National Institute
on Alcohol Abuse
and Alcoholism

Department of Health
and Human Services



Understanding Alcohol: Investigations into Biology and Behavior

under a contract from the
National Institutes of Health

National Institute on Alcohol Abuse and Alcoholism



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Foreword

This curriculum supplement, from *The NIH Curriculum Supplement Series*, brings cutting-edge medical science and basic research discoveries from the laboratories of the National Institutes of Health (NIH) into classrooms. As the largest medical research institution in the United States, NIH plays a vital role in the health of all Americans and seeks to foster interest in research, science, and medicine-related careers for future generations. The NIH Office of Science Education (OSE) is dedicated to promoting science education and scientific literacy.

We designed this curriculum supplement to complement existing life science curricula at both the state and local levels and to be consistent with *National Science Education Standards*. It was developed and tested by a team composed of teachers from across the country, scientists, medical experts, other professionals with relevant subject-area expertise from institutes and medical schools across the country, representatives from the NIH National Institute on Alcohol Abuse and Alcoholism (NIAAA), and curriculum-design experts from Biological Sciences Curriculum Study (BSCS), SAIC, and Edge Interactive. The authors incorporated real scientific data and actual case studies into classroom activities. A three-year development process included geographically dispersed field tests by teachers and students.

The structure of this module enables teachers to effectively facilitate learning and stimulate student interest by applying scientific concepts to real-life scenarios. Design elements include a conceptual flow of lessons based on BSCS's 5E Instructional Model of Learning, multisubject integration emphasizing cutting-edge science content, and

built-in assessment tools. Activities promote active and collaborative learning and are inquiry-based to help students develop problem-solving strategies and critical thinking.

Each curriculum supplement comes with a complete set of materials for both teachers and students including printed materials, extensive background and resource information, and a Web site with interactive activities. These supplements are distributed at no cost to teachers across the United States. All materials may be copied for classroom use but may not be sold. We welcome feedback from our users. For a complete list of curriculum supplements, updates, availability, and ordering information, or to submit feedback, please visit our Web site at <http://science.education.nih.gov> or write to

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We appreciate the valuable contributions of the talented staff at BSCS, SAIC, and Edge Interactive. We are also grateful to the NIH scientists, advisors, and all other participating professionals for their work and dedication. Finally, we thank the teachers and students who participated in focus groups and field tests to ensure that these supplements are both engaging and effective. I hope you find our series a valuable addition to your classroom and wish you a productive school year.

Bruce A. Fuchs, Ph.D.
Director
Office of Science Education
National Institutes of Health

1 In 1996, the National Academy of Sciences released the *National Science Education Standards*, which outlines what all citizens should understand about science by the time they graduate from high school. The *Standards* encourages teachers to select major science concepts that empower students to use information to solve problems rather than stressing memorization of unrelated information.

About the National Institutes of Health

Founded in 1887, the National Institutes of Health (NIH) today is the federal focal point for medical research in the United States. Composed of separate institutes and centers, NIH is one of eight health agencies of the Public Health Service within the U.S. Department of Health and Human Services. The NIH mission is to uncover new knowledge about the prevention, detection, diagnosis, and treatment of disease and disability, from the rarest genetic disorder to the common cold. It does this through

- *Research*. Enhancing research outcomes across the medical research continuum by supporting research in NIH's own intramural laboratories as well as the research of nonfederal scientists working in universities, medical schools, hospitals, and research institutions throughout the country and abroad; communicating scientific results; promoting the efficient transfer of new drugs and other technologies; and providing effective research leadership and administration.
- *Research Training and Career Development Program*. Supporting research training and outreach designed to ensure a continuing supply of well-trained scientists.
- *Research Facilities Program*. Modernizing and improving intramural and extramural research facilities to ensure that the nation's scientists have adequate facilities in which to conduct their work.

Science education efforts by NIH and its institutes and centers are critical in ensuring the continued supply of well-trained basic research and clinical investigators, as well as the myriad professionals in the many allied disciplines who support the research enterprise. These efforts also help educate people about the scientific results so that they can make informed decisions about their own health as well as the health of the public.

This curriculum supplement is one such science education effort, done through the partnership of the NIH National Institute on Alcohol Abuse and Alcoholism, the NIH Office of Science Education, and Biological Sciences Curriculum Study (BSCS).

About the National Institute on Alcohol Abuse and Alcoholism

The National Institute on Alcohol Abuse and Alcoholism (NIAAA) supports and conducts biomedical and behavioral research on the causes, consequences, treatment, and prevention of alcoholism and alcohol-related problems. NIAAA also provides leadership in the national effort to reduce the severe and often fatal consequences of these problems by

- conducting and supporting research directed at determining the cause of alcoholism, discovering how alcohol damages the organs of the body, and developing prevention and treatment strategies for application in the nation's healthcare system;
- supporting and conducting research across a wide range of scientific areas including genetics, neuroscience, medical consequences, medication development, prevention, and treatment through the award of grants and within the NIAAA intramural research program;
- conducting policy studies that have broad implications for alcohol-problem prevention, treatment, and rehabilitation activities;
- conducting epidemiological studies such as national and community surveys to assess risks for and magnitude of alcohol-related problems among various population groups;
- collaborating with other research institutes and federal programs relevant to alcohol abuse and alcoholism and providing coordination for federal alcohol-abuse and alcoholism activities;
- maintaining continuing relationships with institutions and professional associations; international, national, state, and local officials; and voluntary agencies and organizations engaged in alcohol-related work; and
- disseminating research findings to healthcare providers, researchers, policymakers, and the public.

Introduction to *Understanding Alcohol: Investigations into Biology and Behavior*

“Although alcohol is sometimes referred to as a ‘gateway drug’ for youth because its use often precedes the use of other illicit substances, this terminology is counterproductive; youth drinking requires significant attention, not because of what it leads to, but because of the extensive human and economic impact of alcohol use by this vulnerable population.”⁴³

—Dr. Enoch Gordis, former Director
of the National Institute on Alcohol
Abuse and Alcoholism

Despite the legal drinking age of 21, alcohol consumption by underage individuals is not rare. A recent survey showed that 26 percent of eighth graders reported consuming alcohol within the month prior to the survey, and 16 percent reported binge drinking during the two weeks before the survey.⁴² The effects of adolescent drinking involve both health- and safety-related problems, including auto crashes, domestic violence, and suicide. Alcohol abuse among teenagers may also be related to behavioral problems linked to impulsiveness and sensation seeking. Youth-alcohol-use data indicate that the earlier an individual begins drinking, the greater is his or her risk of developing alcohol-use disorders in the future.²⁶

What Are the Objectives of the Module?

Understanding Alcohol: Investigations into Biology and Behavior has four objectives. The first is to help students understand how alcohol consumption affects the functioning of the body. By focusing on the scientific issues that explain how the body reacts to alcohol, the module seeks to help students make informed decisions about the use of alcohol in their lives.

The second objective is to use the topic of alcohol as a way to understand important scientific concepts. The activities in this module incorporate concepts such as concentration and solubility (miscibility), as well as build important skills in observation, critical thinking, experimental design, and data analysis.

The third objective is to convey to students the purpose of scientific research. Scientific research changes the way we understand the world around us and gives us the foundation for improving our choices about our personal health and the health of the public. In this module, students see that science provides evidence that can be used to support ways of understanding and treating human disease. Because the mission of NIAAA includes increasing the public’s understanding about the causes, consequences, treatment, and prevention of alcoholism and alcohol-related problems, the Institute believes that education provides one context in which it can fulfill its mission.

We have designed the lessons in this module to encourage students to think about the relationships among knowledge, choice, behavior, and enhanced human health in this way:

**Knowledge (what is known and not known) +
Choice = Power**

Power + Behavior = Enhanced Human Health

The final objective is to encourage students to think in terms of these relationships now and as they grow older.

Why Teach the Module?

Middle school life science classes offer an ideal setting for integrating many areas of student interest. In this module, students participate in activities that integrate inquiry science, environmental studies, human health, history, decision-making concepts, and mathematics. The real-life context of the module's classroom lessons is engaging for students, and the knowledge gained by participating in the module can be applied immediately to students' lives.

“It [the module] could be easily done by my special-ed students, as well as keeping the interest of the gifted students.” – Field-Test Teacher

“I thought that the lessons were very informative, and it is all information that everyone needs to know about.” – Field-Test Student

What's in It for the Teacher?

Understanding Alcohol meets many of the criteria by which teachers and their programs are assessed.

- The module is **standards based** and meets science content, teaching, and assessment standards as expressed in the *National Science Education Standards*. It pays particular attention to the standards that describe what students should know and be able to do with respect to **scientific inquiry**.
- As described above, it is an **integrated** module, drawing most heavily from the subjects of science, history, mathematics, and health.

- The module has a **Web-based technology component** that includes videos and interactive simulations.
- Finally, the module includes built-in **assessment** tools, which are noted in each of the lessons with an assessment icon.

In addition, the module provides a means for **professional development**. Teachers can engage in new and different teaching practices like those described in this module without completely overhauling their entire yearlong program. In *Designing Professional Development for Teachers of Science and Mathematics*,³³ Susan Loucks-Horsley et al. write that supplemental modules such as *Understanding Alcohol: Investigations into Biology and Behavior* can “offer a window through which teachers can get a glimpse of what new teaching strategies look like in action.” By experiencing a short-term unit like this one, teachers can “change how they think about teaching and embrace new approaches that stimulate students to problem solve, reason, investigate, and construct their own meaning for the content.” The use of a supplemental unit like this module can encourage reflection and discussion and stimulate teachers to improve their practices by focusing on student learning through inquiry.

The following table correlates topics often included in the middle school curriculum with the major concepts presented in this module. This information is presented to help teachers make decisions about incorporating this material into the curriculum.

Correlation of *Understanding Alcohol* to Common Middle School Topics

Topic	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Chemical composition of matter		✓				
Individual variation and susceptibility			✓	✓	✓	
Human health and medicine	✓				✓	✓
Risk assessment and management					✓	✓
Scientific methods		✓	✓		✓	
Relationship among science, technology, and society	✓			✓	✓	✓

Implementing the Module

The six lessons in this module are designed to be taught in sequence for one to two weeks (as a supplement to the standard curriculum). The following pages offer general suggestions about using these materials in the classroom; you will find specific suggestions in the procedures provided for each lesson.

What Are the Goals of the Module?

Understanding Alcohol: Investigations into Biology and Behavior is designed to help students develop the following major goals associated with scientific literacy:

- to understand a set of basic scientific principles related to the use and abuse of alcohol and its effects on human health;
- to experience the process of scientific inquiry and develop an enhanced understanding of the nature and methods of science; and
- to recognize the role of science in society and the relationship between basic science and human health.

What Are the Science Concepts and How Are They Connected?

We have organized the lessons to form a conceptual whole that moves students from thinking about what they already know, or think they know, about alcohol (*Alcohol: Separating Fact from Fiction*), to investigating how much alcohol is in different types of alcoholic beverages and how the alcohol is distributed in the body (*A Drink Is a Drink, but People Are Different*). Students next use simulations to investigate how alcohol affects movement of mice at different doses, at different times after consumption, and in different genetic strains (*Responding to Alcohol: What's Important?*).

Students then discover that alcohol use spans a continuum from no use, to use, to abuse, to alcoholism, and that how an individual's drinking is categorized depends on a variety of factors including personal choice (*Alcohol Use, Abuse, and Alcoholism*). Students focus their understanding of how alcohol affects a person's functioning by considering how drinking alcohol impairs cognitive and motor skills. The amount of alcohol, the pattern of drinking, and the individual's gender and body type influence how high the blood alcohol concentration is and how long it takes for it to decrease (*Alcohol and Driving: When to Say No*). Through consideration of how alcohol affects mental and physical abilities, students begin to consider how alcohol could affect them if they choose to drink. Finally, students synthesize the information they have learned to decide whether the use of alcohol should be restricted for all public activities and not just driving (*Using Alcohol: Setting Limits*). The tables on pages 8 and 9 illustrate the science content and conceptual flow of the six lessons.

How Does the Module Correlate to the National Science Education Standards?

Understanding Alcohol: Investigations into Biology and Behavior supports teachers in their efforts to reform science education in the spirit of the National Research Council's 1996 *National Science Education Standards (NSES)*. The content of the module is explicitly standards based: Each time a standard is addressed in a lesson, an icon appears in the margin and the applicable standard is identified. The Content Standards: Grades 5–8 chart on pages 6 and 7 lists the specific content standards that this module addresses.



Content Standards: Grades 5–8

<p>Standard A: As a result of activities in grades 5–8, all students should develop</p>	<p>Correlation to <i>Understanding Alcohol: Investigations into Biology and Behavior</i></p>
<p>Abilities necessary to do scientific inquiry</p> <ul style="list-style-type: none"> • Identify questions and concepts that guide scientific investigations. • Design and conduct a scientific investigation. • Use appropriate tools and techniques to gather, analyze, and interpret data. • Develop descriptions, explanations, predictions, and models using evidence. • Think critically and logically to make the relationships between evidence and explanations. • Recognize and analyze alternative explanations and predictions. • Communicate scientific procedures and explanations. • Use mathematics in all aspects of scientific inquiry. <p>Understandings about scientific inquiry</p> <ul style="list-style-type: none"> • Different kinds of questions suggest different kinds of scientific investigations. Some involve observing and describing objects, organisms, or events; some involve collecting specimens; some involve experiments; some involve seeking more information; some involve discovery of new objects; and some involve making models. • Mathematics is important in all aspects of scientific inquiry. 	<p>Lessons 1, 2, 3, 6</p> <p>Lesson 3</p> <p>Lesson 3</p> <p>Lessons 1, 2, 3, 4, 5</p> <p>Lessons 1, 2, 3, 5, 6</p> <p>Lessons 1, 2, 3, 4, 6</p> <p>Lessons 1, 2, 3, 4, 5, 6</p> <p>Lessons 2, 3, 4, 5</p> <p>Lessons 2, 3, 4, 5</p> <p>Lessons 2, 3, 4, 5</p>
<p>Standard C: As a result of their activities in grades 5–8, all students should develop understanding of</p>	
<p>Structure and function in living systems</p> <ul style="list-style-type: none"> • Living systems at all levels of organization demonstrate the complementary nature of structure and function. Important levels of organization for structure and function include cells, organs, tissues, organ systems, whole organisms, and ecosystems. • Specialized cells perform specialized functions in multicellular organisms. Groups of specialized cells cooperate to form a tissue, such as muscle. Different tissues are in turn grouped together to form larger functional units, called organs. Each type of cell, tissue, and organ has a distinct structure and set of functions that serve the organism as a whole. • The human organism has systems for digestion, respiration, reproduction, circulation, excretion, movement, control, coordination, and protection from disease. These systems interact with one another. 	<p>Lessons 2, 5</p> <p>Lessons 2, 5</p> <p>Lessons 2, 3, 5</p>

<ul style="list-style-type: none"> • Disease is a breakdown in structures or functions of an organism. Some diseases are the result of intrinsic failures of the system. Others are the result of damage by infection from other organisms. <p>Reproduction and heredity</p> <ul style="list-style-type: none"> • The characteristics of an organism can be described in terms of a combination of traits. Some are inherited and others result from interactions with the environment. <p>Regulation and behavior</p> <ul style="list-style-type: none"> • Behavior is one kind of response an organism can make to an internal or environmental stimulus. 	<p>Lessons 4, 6</p> <p>Lessons 3, 4, 5, 6</p> <p>Lessons 1, 3, 4, 5, 6</p>
<p>Standard F: As a result of their activities in grades 5–8, all students should develop understanding of</p>	
<p>Personal health</p> <ul style="list-style-type: none"> • The potential for accidents and the existence of hazards impose the need for injury prevention. Safe living involves the development and use of safety precautions and the recognition of risk in personal decisions. • Alcohol and other drugs are often abused substances. Such drugs change how the body functions and can lead to addiction. <p>Risks and benefits</p> <ul style="list-style-type: none"> • Risk analysis considers the type of hazard and estimates the number of people who might be exposed and the number likely to suffer consequences. The results are used to determine the options for reducing or eliminating risks. • Students should understand the risks associated with natural hazards (fires, floods, tornadoes, hurricanes, earthquakes, and volcanic eruptions), chemical hazards (pollutants in air, water, soil, and food), biological hazards (pollen, viruses, bacteria, and parasites), social hazards (occupational safety and transportation), and personal hazards (smoking, dieting, and drinking). • Important personal and social decisions are made based on perceptions of benefits and risks. 	<p>Lessons 1, 5, 6</p> <p>Lessons 1, 2, 3, 4, 5, 6</p> <p>Lessons 4, 5, 6</p> <p>Lessons 1, 4, 5, 6</p> <p>Lessons 4, 5, 6</p>
<p>Standard G: As a result of activities in grades 5–8, all students should develop understanding of</p>	
<p>Science as a human endeavor</p> <ul style="list-style-type: none"> • Science requires different abilities, depending on such factors as the field of study and type of inquiry. Science is very much a human endeavor, and the work of science relies on basic human qualities, such as reasoning, insight, energy, skills, and creativity, as well as on scientific habits of minds, such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. 	<p>Lessons 1, 2, 3, 6</p>

Teaching Standards

The suggested teaching strategies in all the lessons support teachers as they work to meet the teaching standards outlined in the *National Science Education Standards*. The module helps teachers of science plan an inquiry-based science program by providing short-term objectives for students. It also includes planning tools such as the Conceptual Flow of the Lessons chart and the Suggested Timeline for teaching the module. Teachers can use this module to update their curriculum in response to their students' interest in this topic. The focus on active, collaborative, and inquiry-based learning in the lessons helps teachers support the development of student understanding and nurture a community of science learners.

The structure of the lessons in this module enables teachers to guide and facilitate learning. All the activities encourage and support student inquiry, promote discourse among students, and challenge students to accept and share responsibility for their learning. The use of the 5E Instructional Model combined with active, collaborative learning, allows teachers to respond effectively to the diversity of student backgrounds and learning styles. The module is fully annotated, with suggestions for how teachers can encourage and

model the skills of scientific inquiry, as well as the curiosity, openness to new ideas and data, and skepticism that characterize science.

Assessment Standards

Teachers can engage in ongoing assessment of their teaching and of student learning using the variety of assessment components embedded within the module's structure. The assessment tasks are authentic: They are similar in form to tasks in which students will engage in their lives outside the classroom or in which scientists participate. Annotations guide teachers to these opportunities for assessment and provide answers to questions that can help teachers analyze student feedback.

How Does the 5E Instructional Model Promote Active, Collaborative, Inquiry-Based Learning?

Because learning does not occur through a process of passive absorption, the lessons in this module promote active learning: Students are involved in more than listening and reading. They are developing skills, analyzing and evaluating evidence, experiencing and discussing, and talking to their peers about their own understandings. Students work collaboratively with others to solve problems

Science Content and the Lessons

Lesson	Science Content
Lesson 1	Distinguishing between observation and inference.
Lesson 2	Concentration and miscibility. Relating body type to an individual's response to alcohol.
Lesson 3	Use of animal models. Effects of dose, time after ingestion, and genetic background on individual response to alcohol.
Lesson 4	Factors influencing alcohol use and abuse. Interactions of genetics and the environment.
Lesson 5	Calculation of blood alcohol concentrations (BACs). Effects of metabolism, gender, and body size and type.
Lesson 6	Relating BAC levels to impairments. Assessing risks and costs of alcohol use to the individual and to society.

Conceptual Flow of the Lessons

Lesson	Learning Focus	Major Concept
Lesson 1 <i>Alcohol: Separating Fact from Fiction</i>	Engage*: In this lesson, students express prior knowledge and become engaged in the study of alcohol, its use and abuse, and alcoholism.	Students receive mixed messages about alcohol use. They are warned of its dangers, yet it is portrayed as part of a desirable lifestyle in movies, media, and advertisements.
Lesson 2 <i>A Drink Is a Drink, but People Are Different</i>	Explore: In this lesson, students explore the alcohol content of various types of alcoholic beverages and how alcohol distributes in the human body. The Explore phase gives students a common set of experiences upon which to begin building conceptual understanding.	The total amount of alcohol in a typical serving of beer, wine, or hard liquor is about the same. Alcohol distributes throughout the water-containing portions of the body. The brain has a high water content, and alcohol exerts many of its effects here.
Lesson 3 <i>Responding to Alcohol: What's Important?</i>	Explore/Explain: Students analyze simulations of the effects of alcohol on mouse activity levels. Students express their understanding of the simulations in their own words and by using graphs.	The greater the dose of alcohol, the greater the effect on behavior. Alcohol is metabolized by the body. Its effects decrease with increasing time after consumption. Individuals within a population differ in their response to alcohol. Such differences are partly due to genetics.
Lesson 4 <i>Alcohol Use, Abuse, and Alcoholism</i>	Explain/Elaborate: Students continue to investigate how and why humans use alcohol. They broaden their conceptual understanding and apply what they have learned in a new context.	Alcohol use ranges along a continuum from abstinence to use, to abuse, to alcoholism. Where an individual falls along this continuum depends on genetic and environmental factors. Personal choice plays a key role in an individual's decision to use alcohol.
Lesson 5 <i>Alcohol and Driving: When to Say No</i>	Explain/Elaborate: Students refine their understanding of how alcohol affects human behavior and begin to consider how alcohol could affect their own lives.	Drinking alcohol impairs the functions of the mind and body. The extent of impairment depends upon the amount of alcohol in the blood. This in turn depends upon many factors including the drinker's body weight, gender, and amount and pattern of drinking.
Lesson 6 <i>Using Alcohol: Setting Limits</i>	Elaborate/Evaluate: In this lesson, students apply what they have learned in previous lessons to a new situation to demonstrate their understanding of concepts.	The effects of drinking alcohol are dose dependent. People who drink and have blood alcohol concentrations below the legal limit for driving may still be impaired. Public policies aimed at alcohol must balance many factors.

*See How Does the 5E Instructional Model Promote Active, Collaborative, Inquiry-Based Learning?, on page 8.

and plan investigations. Many students find they learn better when they work with others in a collaborative environment than when they work alone in a competitive environment. When all this active, collaborative learning is directed toward inquiry science, students succeed in making their own discoveries. They ask questions, observe, analyze, explain, draw conclusions, and ask new questions. These inquiry experiences include both those that involve students in direct experimentation and those in which students develop explanations through critical and logical thinking.

This view of students as active thinkers who construct their own understanding out of interactions with phenomena, the environment, and other individuals is based on the theory of constructivism. A constructivist view of learning recognizes that students need time to

- express their current thinking;
- interact with objects, organisms, substances, and equipment to develop a range of experiences on which to base their thinking;
- reflect on their thinking by writing and expressing themselves and comparing what they think with what others think; and
- make connections between their learning experiences and the real world.

This module provides a built-in structure for creating a constructivist classroom: the 5E Instructional Model. This model sequences the learning experiences so that students have the opportunity to construct their understanding of a concept over time. The model takes students through five phases of learning that are easily described using five words that begin with the letter “E”: Engage, Explore, Explain, Elaborate, and Evaluate. The following paragraphs illustrate how the 5Es are implemented across the lessons in this module.

Engage

Students come to learning situations with prior knowledge. This knowledge may or may not be congruent with the concepts presented in this module. The Engage lesson provides the opportunity for teachers to find out what students already know or what they think they know about the topic and concepts to be developed.

The Engage lesson in this module, Lesson 1, *Alcohol: Separating Fact from Fiction*, is designed to

- pique students’ curiosity and generate interest,
- determine students’ current understanding about alcohol and its use,
- invite students to raise their own questions about alcohol use and its effects on human health,
- encourage students to compare their ideas with the ideas of others, and
- enable teachers to assess what students do or do not understand about the stated outcomes of the lesson.

Explore

In the Explore phase of the module, parts of Lesson 2, *A Drink Is a Drink, but People Are Different*, and Lesson 3, *Responding to Alcohol: What’s Important?*, students explore what an alcoholic drink really is, where alcohol goes in the body, and how it affects the activity level of mice. These lessons provide a common set of experiences within which students can compare what they think about what they are observing and experiencing.

During the Explore lessons in this module, Lesson 2, *A Drink Is a Drink, but People Are Different*, and Lesson 3, *Responding to Alcohol: What’s Important?*, students

- interact with materials, ideas, classroom demonstrations, and simulations;
- consider different ways to solve a problem or answer a question;
- acquire a common set of experiences with their classmates so they can compare results and ideas;
- observe, describe, record, compare, and share their ideas and experiences; and
- express their developing understanding of the effects of alcohol on behavior using graphs and by answering questions.

Explain

The Explain lesson provides opportunities for students to connect their previous experiences and begin to make conceptual sense of the main

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